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East Europe Report

SCIENCE AND TECHNOLOGY

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EAST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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CEMA WELDING TECHNOLOGY COOPERATION OUTLINED

East Berlin NEUE ZEIT in German 14 Jul 84 p 7

[Interview with Prof Dr Alexis Neumann, Engineer, Karl Marx Stadt Technical College, Member, CDU Main Executive Committee; by Matthias Schlegel: "Cooperation in Science"; date and place not specified.]

[Text] Question: Cooperation among the CEMA nations in the field of welding technology--your "special area" as a scientist and educator--has a long and illustrious tradition. How is this cooperation among specialists in the socialist states organized?

Answer: Like all activities involving socialist economic integration, cooperative efforts in the field of welding technology are guided and directed from the seat of the Council for Economic Mutual Assistance in Moscow. Technical coordination and organization is the responsibility of the world-renowned Paton Institute in Kiev; this coordination center is the hub of all such activity. In our republic, this directive function is fulfilled by the Central Institute for Welding Technology in Halle, of which Professor Werner Gilde is the director.

Scientific and technical cooperation is divided into various categories. One key category, which has been assigned the consecutive number 9, deals with mathematics in welding technology. This is the area of scientific cooperation in which I am active. Since its inception 12 years ago, I have directed this technology sector which brings together experts from 6 socialist countries.

Generally speaking we are involved with the development of computer-aided mathematical principles for practical application in welding technology, i.e. the application of mathematical methods in the analysis of welding processes to optimize these processes in manufacturing.

Question: In April of this year you headed the 12th CEMA specialists' conference at the Warnemuende/Wustrow maritime engineering college which dealt with problems of welding technology. What were the topics of discussion at the conference?

Answer: Because we carry out our joint research work in accordance with precisely defined five-year plans, we meet once each year to see what has been

accomplished and to coordinate work yet to be done. The one-week conference in Warnemuende was one of these regular meetings and, as is the case with all such conferences, it led to a comprehensive exchange of experiences as well as a study of the practical application of the results of our research. Since the current five-year plan concludes in 1985, we also discussed and agreed upon the basis for our research work up until 1990.

Question: Would you please tell us briefly what some of the results of scientific cooperation in your area have been in the past several years?

Answer: We have achieved around 20 concrete results so far during this five-year plan period. The participants at the Warnemuende specialists' conference saw first-hand the great benefit of one such result during a trip to the people's shipyard in Stralsund. In welding the large numbers of ribs required for the hulls of the ships, the heat of the welding process used to cause unpredictable distortion of the ribs which then had to be eliminated by a time-consuming straightening process subsequent to welding. Now, through use of an additional heat source controlled by a process computer which is continually supplied with measurement data, it is possible to continuously counteract such deviations. This solution, which will also be put into practice shortly at the Warnow shipyard in Warnemuende, was developed jointly by a collective of the Warnemuende/Wustrow engineering college headed by Professor Beyer and specialists at the Paton Institute headed by Professor Machnenko.

Under the leadership of the Baumann Technical College in Moscow, a software package with annual benefits of 100,000 rubles was developed for use in the field of machine construction to calculate heat generation during laser welding.

Question: Other than the example you just cited, in which areas are GDR scientists making significant contributions?

Answer: Examining weld quality is often a complicated and time-consuming problem. Weld examination is of particular importance in joints subjected to high loading. There are two ways to do this: Either every weld can be examined--a procedure which is usually very involved--or spot checks can be made, in which case reliability is decreased. To use mathematics in the development of more economical examination procedures was a real challenge for our specialists.

Scientists in Moscow developed the theoretical principles for statistical models, which were then upgraded to a specification by our colleagues at the Central Institute for Welding Technology in Halle and our technical college in Karl Marx Stadt. The result was a statistical system for the quality control of welded joints which can be used in machine construction factories, for example, to provide more accurate information within a reduced scope of examination.

Another category is weldability, an area in which the Wilhelm Pieck University in Rostock has gained a wealth of knowledge. We know that heat treatment can be required before, during or after welding. Together with experts from

Czechoslovakia and the USSR, our colleagues in Rostock have developed a mathematical system which allows us to determine where treatment must be performed in each individual case and with what amount of heat. This information has been summarized in a book entitled "Schweiss-ZTU-Schaubilder" (Welding TTT Curves), for which a license has already been granted to the FRG.

Question: Professor Neumann, you have been an engineer for 35 years. As a bridge design engineer you were once intimately involved with statics, then you entered the field of welding technology, and in particular its mathematical principles. For a long time you have again been building bridges--bridges of friendship and cooperation between the scientists of the CEMA nations. In view of the wealth of information which has been gained in the field of welding technology, are there still any untouched areas which could be developed through international scientific cooperation?

Answer: We must first realize that the real benefit of joint cooperation is a considerable increase in the effectiveness of research brought about by the collaboration of leading researchers in different countries, each contributing his or her intellectual and material scientific and technical resources. Cooperation is also of great advantage because it is just this development of mathematical models and statistical methods which is such painstaking work. The division of labor therefore makes a lot of sense.

At the same time--and I think this is what you were referring to--it is precisely mathematics, as a link in the solution of problems of welding technology in conjunction with immediate use of data via computers, which has so much heretofore unimagined potential. It is for this reason that our activity in the future will center around the development of software to investigate welding processes, to evaluate the loadability, design and manufacture of welded joints and to optimize all of these. The development of automatic welding process control systems is also a broad field in which microelectronics plays a significant part due to the sensors, transducers and interfaces which automatic welding systems require.

The frequent application of mathematical models is valuable in any case, and in this regard--and now we've come back to our original topic--socialist cooperation across national borders is a great asset.

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MICROELECTRONICS COMBINE DIRECTOR ON INDUSTRY'S EXPANSION

East Berlin NATIONAL ZEITUNG in German 3 Aug 84 p 3 and 4-5 Aug 84 p 5

[Juergen Rodemann Interview with Dr Heinz Wedler, General Director, Erfurt VEB Microelectronics Combine: "Dealing With a Pacesetter and its Challenges: Microelectronics Is Effecting Structural Change Within the National Economy and Standards for Scientists in the Field of International Class Conflict"]

[Text] Our interlocutor, Dr of Economic Sciences Heinz Wedler, 57 years old, a National Prize winner, is married. The vocation he trained for: Precision mechanic. He is qualified as an engineer in precision mechanics and is a graduate economist. Beginning in 1962 he became a plant manager, and from 1967 on the general director of the Ruhla VEB Clock and Machine Combine. In 1969 he successfully defended his doctoral dissertation A and in 1981 his B doctorate. Since 1978, he has been general director of the newly formed VEB Microelectronics Combine. Dr Wedler has written several scientific works and gives lectures at colleges and universities in the GDR.

Question: Could you please first of all summarize for our readers the field of activity of the VEB Microelectronics Combine, as this arises from the economic strategy of the 1980's, and explain its importance to the structure of the national economy? What does the utilization of microelectronics mean for our continuation on the course of establishing a unity of economic and social policy?

Dr Wedler: As is surely generally known, the rapid development, reliable production, and broad utilization of microelectronics make up a principal element of the economic strategy in our republic for ensuring the necessary increase in output in the overall economy. It is the prerequisite for the thorough-going continuation of the policy course relating to our primary task.

On the other hand, the unity of economic and social policy in the GDR ensures that microelectronics, as a paramount driving force of scientific-technical progress, is always being used for the purpose of raising the total level of economic performance. Here is where the great strength lies

of the link between the advantages of socialism and the achievements of the scientific-technical revolution.

Therefore the reason why such a great importance is attributed to microelectronics is because it substantially governs the pace of growth and the level of labor productivity, in that it is conducive to saving on material and energy, to freeing workers for other tasks, and to making the character of the work easier or more interesting.

Through the use of microprocessor engineering, from one generation of equipment to the next the labor productivity is raised by up to 25 percent, a savings of material and energy of up to 30 percent in each case is achieved, and repair, maintenance, and servicing requirements are lowered as much as 30 percent by way of prolonging the lifetime of the equipment.

Thus the utilization of microelectronics leads to a new high level of intensification and influences to a great degree the broader shaping of the developed socialist society in almost all fields.

With microelectronics it has become possible to effectively improve many products and to create a wide range of completely new products. Microelectronics makes it possible to develop equipment whose production would be unthinkable with traditional technologies.

Robots, Cameras, and Wristwatches

On the basis of highly integrated circuits, efficient computers which take up very little room are being made which handle and process a great many items of data and information. It can be said that nowadays everyone comes into contact with microelectronics in some way or other. In the work place, where for example electronic control systems optimize manufacturing processes, where robots relieve the person of routine work, where office computers do tedious calculations within seconds. In the household, where television sets, radio and phonograph equipment, refrigerators and washing machines are being given new performance-value properties on the basis of microelectronic components. Let us not forget also quartz watches or pocket calculators. The home computer developed at our combine will be moving into the spheres of leisure-time activities, education, science, crafts, and trade.

At the train station, our tickets are printed up by microelectronic means. In many cases cameras are automatically handling the aperture selection or exposure-time setting, allowing us to concentrate fully on the subject.

Thus, nowadays microelectronics is already quite commonplace, and yet developments are taking place at a breathtaking speed. We must keep abreast here, because the position of our republic as one of the 10 leading industrial states in the world is not one we can rest in but must be fought for and defended constantly.

The political weight of the GDR in the international struggle for peace is based not least on its economic capability.

It follows from all that we have said that our combine has the responsibility, as a supplier of electronic components, to create the prerequisites for an increase in output by the combines in other fields of the national economy, and ultimately as an end producer to itself develop and manufacture high-grade electronic equipment and consumer goods.

Thus, by now we can offer to the country's economy about 1,100 different types of components. Of these, almost half are from our own production line.

This broad range of products, with which almost all possible applications can be supplied, is the result of our close cooperation with the Soviet Union and the other socialist countries, especially the CSSR and the Hungarian People's Republic, on the basis of long-range agreements and arrangements.

And I would like to say in addition that every year we start production on between 60 and 90 new types of components, with the degree of integration of the circuits constantly increasing.

Question: Which sectors of the national economy do you consider as your most important partners, and why?

Dr Wedler: The responsibility for development and production in the microelectronics field is just as widespread as the extensively organized application of microelectronics in the GDR.

With the increasingly greater utilization of microelectronics, a fundamental structural change is taking place in the national economy which goes beyond the scope of previous experiences and limits of responsibility and requires new relations of economic cooperation at a high level.

Our combine, as a research, development, and production center for components of microelectronics and semiconductor engineering, equipment of specialized technologies, high-vacuum engineering, and electronic consumer goods such as watches, pocket calculators, home computers, pocket radios, and similar devices, fits into the overall pattern of the development and application of microelectronics in the GDR.

Microelectronics is a result of many sciences such as physics, chemistry, and mathematics. For its development and production, extensive scientific-technical and production capacities are required in the areas of machinery construction for specialized technologies, scientific-instrument manufacture, measurement engineering, the chemical industry, metallurgy, and the glass and ceramics industry.

Our main customers are the combines of Dresden Robotron, Jena VEB Carl Zeiss, the VEB Communications Electronics Combine, the VEB Automation Equipment Construction Combine, the VEB Radio and Television Combine, the Suhl VEB Electrical Equipment Works Combine, and the Dresden VEB Pentacon.

Saving Time by Using the Computer

When one considers that our microprocessors and memory circuits are finding their way into, for example, minicomputers of the VEB Robotron Combine and that these themselves are again a part of the control systems in machine-tool or equipment construction, and in fact ultimately even in our equipment of specialized technologies for component production, then the close economic interrelationships and great responsibility of the VEB Microelectronics Combine become clear.

Question: What standards apply to scientists and engineers in your combine, and in general what can be justifiably expected today from members of the scientific-technical intelligentsia in our republic with respect to their attitude and working morale?

Dr Wedler: The 7th Conference of the SED Central Committee set the task, which was confirmed at the 8th Conference, of resolutely focusing the intellectual and material capability of our country in every field on the job of arriving at a higher efficiency through new technologies and products. This places heavy demands on all scientists and engineers, because here what is at stake is well-grounded preliminary information and scientific-technical solutions based on an analysis of world market conditions and the needs of the user, with such solutions resulting in benefits for the entire society.

It is a fact that new scientific-technical information and results must be vigorously used in the class war on the economic level, so that in the field of microelectronics the international class conflict has a very concrete effect extending as far as individual jobs. Thus such specialized work takes on the status of a political task.

Therefore in addition to purely technical knowledge and skill, political education and social commitment are also of great importance for the sake of an awareness of responsibility in scientific work and for becoming involved in the overall social objective.

This is true especially of the scientist in microelectronics, because he has the task of acting as a pacemaker, so to speak, of scientific-technical progress in this field. He has to uncompromisingly face up to the tremendous speed at which the quality and quantity of knowledge are developing in the age of the scientific-technical revolution.

He must promptly recognize new developmental trends, appropriately and systematically incorporate the information on hand in the subject area and in tangential branches, acquire new knowledge, and adapt it effectively to the overall task. The scientist must also have such qualities as a willingness to communicate and a collective spirit, because nowadays scientific work is always collective work.

Today more than ever, commitment and discipline are pertinent to raising the efficiency of scientific work, because the result must be available, not at some time or other, but at the earliest possible time, with it also

needing to be of the highest possible quality. Finally, another requirement is for the scientist to be in a position to avail himself of modern computer technology, which contributes substantially to a saving of time.

Great Demands on the Leaders

Question: When did you initially come into contact with microelectronics? Does a general director find time for research work?

Dr Wedler: I would like to begin with the second part of the question. It goes without saying that even a general director must take time for scientific work. The starting point for substantial results in research and development, and this is certainly true not only for me or the microelectronics combine, lies in the stimulating, encouraging attitude of the governmental director. One of his tasks is also to determine the direction taken with respect to the content of work done in research, technology, and engineering.

To that end, I cultivate close contacts with the institutes of the Academy of Sciences, the colleges, and the technical schools, and I familiarize myself with important new results in basic research or applied research. At the same time, the possibility thus presents itself of consulting with the directors and scientists on solutions to problems in the field of preliminary research or research and development.

I regard it as absolutely necessary to keep oneself informed of what is happening in the area of science and engineering, so as to be able to assess certain developmental trends and from that to derive tasks for the combine.

A responsible director cannot rely solely on the knowledge and the advice of his specialists, but must himself gain an overall view of the entire process of scientific-technical progress, possibly study in more detail certain special questions, and acquire a personal viewpoint.

Qualified for New Tasks

In addition to the already mentioned contacts with scientists, this is also made possible through the study of pertinent technical literature, by visits to enterprises at home and abroad, the visiting of fairs and exhibitions, and in other ways.

Of course, these conditions already applied to me before I was charged with heading the Microelectronics Combine. And here I have arrived at the first part of the question. Naturally, in the field of precision mechanics and mechanical engineering as well, for a person to remain in contact with scientific-technical progress has meant that he must concern himself in a timely way with the developing branch of microelectronics. Of course, especially after a large microelectronics capability was established in our country in line with the resolutions of the SED 8th Party Congress, all workers who were associated with this process had to achieve a new level of qualification. The fact that this has succeeded speaks well for the

quality of our educational system and testifies to the advantages of the socialist planned economy.

Question: In the proclamation at the 35th anniversary of the founding of the GDR, a specific reference was made to the industrial branch of microelectronics, which has arisen since the SED 8th Party Congress and which influences all sectors of our economy. How can this great potential be used even more efficiently?

Dr Wedler: The answer to this question is also contained in the proclamation at the 35th anniversary of the GDR, when it is said that the decisions about the further advancement of socialism and thus also for the preservation of peace are to be made above all in the sector of the economy, with the further comment that: "With its intellectual potential and its material resources, the GDR is capable of the kind of increase in output which is demanded today and will be demanded in the future....Only through growth and a high efficiency in the economy do we show to the best advantage the meaning of socialism, and there is no alternative to this."

In concrete terms, this means to proceed further on the adopted course of the comprehensive intensification of production, in order to ensure the growth of the national income together with a decrease in absolute terms in the consumption of energy, raw materials, and material--in short, to decisively improve the relationship of expenditure to result. But that also means to accelerate with the help of microelectronics the development of a production and export program geared to the market requirements and the desires of the population.

Interest in Inventing Encouraged

The potential users in all fields of the national economy would be ill advised if they were willing to wait for ready-made solutions for microelectronics applications to be delivered to their door. Incidentally, this applies not only to the large combines, but also to small and intermediate enterprises, in fact even to sectors of crafts and trade.

It is precisely for these potential users that in all the regions microelectronics consultation and information centers are close at hand, where with the help of experienced specialists initial or additional applications can be developed even for quite special tasks and together with the smallest possible material and financial expenditure.

On the whole, we have already achieved a notable standing in the national economy. After all, it has proved possible to make and put into operation more than 32,000 industrial robots within only a few years. On the basis of our microprocessors, in the GDR there are today already about 43,000 microcomputers in use.

In order to expand and more efficiently use this large potential, very great efforts must still be undertaken still by all users and naturally also by the microelectronics producers themselves. The course for this has been set by the directive on the 1985 plan for the national economy.

Question: How is an interest in inventing promoted in the combine, and what can be said quite generally about the move toward patentable inventions in the combine?

Dr Wedler: We are promoting an interest in inventing in our combine in a manifold way. In this connection, special attention is being paid to young cadres in research and development.

Thus, in many enterprises of the combine Youth Researcher Collectives have been formed which are led by experienced inventors, the objective being to introduce these young cadres to inventive activity.

As a result of this resolute work, in 1983 the VEB Microelectronics Combine was able to take first place in the youth inventor competition among all the combines of the electrical engineering/electronics sector of industry.

Another success has been the initial courses, which were organized in 1983 and this year by the combine leadership, of the "inventor school" within our industry's academy, aimed primarily at young cadres from the research and development departments of the enterprises in the combine.

For purpose of the intensification of inventive activity, we are fully using the chances for the moral and material encouragement of the inventors. For example, the public recognition of inventive achievements has proved to be an extremely positive success. The prize of the general director for outstanding inventive achievements has been awarded for the first time.

The level of the scientific-technical performance of an enterprise expresses itself not least in the number of its patentable inventions.

In the VEB Microelectronics Combine, in 1983 we were able to increase the number of inventions by 79 percent compared to 1980, and in 1984 we want to achieve, with 400 patentable inventions, an increase of 121 percent compared to 1980. With that, this year we will be more than doubling the number of patent notices compared to the beginning of the the 5-year plan period. To make sure that this continual increase in the number of inventions does not preclude raising the level of the inventive solutions is not only a question of the vocational teaching for our cadres in research and development, but above all a leadership task which is to be taken seriously, and which the general director must face up to as well.

Question: In what way does the Microelectronics Combine work together with its partners in the USSR and other countries of the socialist community?

Dr Wedler: The scientific-technical cooperation between the GDR and the Soviet Union plays an exceptional role precisely in the sector of microelectronics. For us it is an important guarantee for the successful mastering of complicated tasks, and I might even say that for us it is a vital one.

On the basis of a comprehensive governmental agreement which was concluded on the occasion of the 31st conference of the Intergovernmental Parity Commission, fundamental prerequisites have been created for linking the capacities of the GDR's microelectronics on a long-term basis, by 1990, to the potential of the USSR, which ranks among the leaders internationally.

In this connection, we are able to rely on the good results and experiences from a close cooperative effort as these are emerging from the realization of the governmental agreement concluded in 1977. Here we have been able to achieve significant successes in the development and production-related application of new technologies, specialized equipment, and components. Together we have coordinated our present and prospective assortment of components in order to ensure high efficiency in research and development.

Standing at the center of all our arrangements is the general agreement, signed at the 35th CEMA Working Conference by the government representatives of the participating countries, on multilateral cooperation in the creation of a standardized, unified base for products of electronic engineering, equipment of specialized technologies, as well as semiconductor materials and specialized industrial materials for their manufacturing.

Ideas Confuse the Chess Computer

Question: Will microelectronics relieve a person of the need to think someday?

Dr Wedler: No, it will quite certainly not do that. And yet this question cannot be answered accurately by a simple yes or no. To many it may seem as if every highly-developed computer is far superior to the human brain, so far as, for example, the handling of concepts or numbers is concerned. Who ever manages to carry out two million computational operations in a second, what person can ever store for an arbitrarily long time millions of items of data, without forgetting anything, as an electronic computer can do?

In many sectors of our society, such as in national economic planning, in meteorology, or in space travel, and above all in production and thus especially in the designing of electronic circuits themselves, there are extremely complicated and complex mathematical tasks which neither a single person nor a larger collective of mathematicians could solve without availing themselves of modern computing equipment. But the logical correlating of individual operational magnitudes, which in fact are first entered as input into the computer by the thinking person, cannot be compared directly with the creative and imaginative way of thinking of human beings.

Compared to the electronic computer, a person makes do with a substantially smaller amount of information and nevertheless is able to solve the most complicated of tasks. The superiority of the human brain is expressed in the fact that it is able to influence his thinking above all through quite subjective, non-algorithmic factors such as experience, feeling, and

imagination. The human is aware of his own existence and his relationship to the environment, in contrast to the robot.

A computer does not have the capability for subjective perception and acting. This becomes clear, for example, in computer chess. Chess competitions between a computer and a player of the master class usually end with the human having the advantage. Although the computer can examine all possible move variants quick as a flash by taking advantage of its great strengths of storage capacity and computing speed, it cannot abstract, generalize, or comprehend the purpose and goal of separate moves. It cannot work out a strategy and cannot proceed tactically. It is confused by moves which do not seem to be logically made. Although it can play consistently, it cannot play in an absolutely original manner.

Again and again, in the discussion of such problems the question arises about the difference between natural and artificial intelligence. In principle it can be stated that almost all components of intelligence can be imitated by mechanical-technical means.

But in the last analysis it is always an imitation. Even if it proves possible someday for automatons to autonomously expand their program repertoire and perfect themselves, even then this will be done only through strictly logical information processing and not from the comprehending of social goals, as is characteristic of a human. This makes him superior. He provides himself with technology by subordinating it to his social purposes. Thus we will not be able to leave thinking to the computers.

Changes in Working Life

Question: How would you view the difference in the application of microelectronics between us and capitalist industrial countries?

Dr Wedler: Of course the economic and social effects of microelectronics cannot be considered in detachment from the social basis. The general objective of achieving rationalization effects on a large scale with the help of applied microelectronics also has a quite different effect on the working and living conditions of the person in the different orders of society.

We need think only of the massive use of industrial robots, which is undertaken with the goal of automating increasingly larger manufacturing steps. If we assume that by 1985 some 45,000 industrial robots will be put in use in the GDR and that for each robot an average of 2.5 workers will be replaced, then this means changes in working and vocational life for more than 100,000 workers. Through rationalization measures it will be possible to free at least 400,000 workers for other economically important projects. But of course nobody needs to be worried about his job. On the contrary: Microelectronics is creating room for more demanding, exactingly creative, and in the last analysis truly satisfying activity.

Workers in the capitalist countries have a different experience. Headlines such as "Job-killer Microelectronics" or "Modern Electronics

Creates Unemployment" are appearing to an increasing degree in the Western press.

Of course, under capitalist conditions the development and application of microelectronics, like every other type of production, serves as well the ends of realizing maximum profits and maintaining the imperialist shares of the market.

Therefore it is not least among the electronics monopolies that a fierce competition has flared up in this field of technological progress, which is supported by the state-monopoly governments in large part through the allocating of financial resources and research facilities.

The rationalization opportunities opening up with microelectronics are resulting in an enormous wasting of social productive capacity, with oppressive social effects. Not only is unemployment rising rapidly, but also the workers remaining in the production process are subjected to an increased labor intensity--that is, to sharpened exploitation.

Question: To what degree does the fast pace of technical progress worldwide, the faster and faster turnover of knowledge, also stimulate research projects and industrial production at your combine?

Dr Wedler: The principle expansion which can be observed at present in the field of activity of scientific-technical progress is directly connected with the necessity for the efficient processing of a constantly growing volume of information in the broadest sense of the word. This is being accompanied by the development of an engineering and of technologies of a new type, a type which is characterized by a combination of energy-converting and information-transforming processes. Visible expressions of this are, among other things, the introduction of robotics on a broad scale, and microcomputer-controlled consumer goods and home computers, with microelectronics itself being one of the most important vehicles of this development.

Typified by Flowers and Microelectronics

The broad application of microelectronics in our national economy requires annual rates of increase in the production of microelectronic circuits of more than 20 percent, with rates of about 50 percent for certain circuits.

The ongoing reduction in the structural dimensions of microelectronic circuits requires the development of new generations of equipment at short intervals of 2-3 years as well as the preliminary development work needed for the technological mastery of such structural sizes. This places extremely high demands on us and presupposes a close cooperation between the development facilities of the Microelectronics Combine and the academic institutes such as, for example, the Institute for Semiconductor Physics at Frankfurt (Oder) and the engineering schools of the college system, within the framework of comprehensive transfer services.

The scientific-technical advances taking place very rapidly worldwide require not least that in our combine we make sure that we have an annual renovation rate of more than 30 percent.

Question: Erfurt has a reputation as a city of flowers. Do you believe that this city with its rich traditions will also see microelectronics as one of its characteristic features someday?

Dr Wedler: Actually Erfurt has had a good reputation also as a city of microelectronics for a long time already. After all, it is not only the more than 7,500 workers of the Erfurt "Karl Marx" VEB Microelectronics who produce microelectronic components and high-grade consumer goods. At the VEB ERFURT electronic, microelectronic machine-control systems for the equipment of the VEB Metal Working Combine are being produced. Right next door, as it were, our components are being introduced in electronic printing equipment of the Erfurt VEB Robotron-Optima Office Machines Factory.

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CSO: 2302/24

VIDEOTON COMPUTERS IN THE GDR

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 p 7

[Article by Dr Otto Bravacz, Videoton Company representative, Berlin: "Videoton Computers in the GDR"]

[Text] The Videoton computers are enjoying a great success in the GDR. Since 1974 they have been operating sixty ES 101, ES 1012 and ES 1011 computer systems and one hundred VT-20 Videoton computer systems. They use our machines primarily in economic, scientific and technical areas and in the real time operating mode. Use of the modern terminals in remote data transmission is especially advantageous.

We have shipped and are now shipping in very significant numbers computer peripherals (displays, card readers, line printers) to our partners to supplement and expand computers in the GDR. Even today we are selling 150-200 line printers per year (about 5 million rubles), but sale of displays has dropped off because they are now using devices which they have developed themselves for their systems, even when the technical level of these falls below the technical level of the Videoton equipment.

About 50 percent of the Videoton computers help solve the following tasks: factory management, planning, production preparation, guidance and control, wage accounting and remote processing.

The computers are used primarily in areas of the economy dealing with the production of material goods. This includes large plants and combines with the most varied commodity structure (a condenser factory, factories manufacturing heavy machines, microelectronics enterprises and light industry enterprises). There is a demand for Videoton machines in the GDR, but the cutback in investment has had an effect. In the present period computer technology investment is possible almost exclusively in the export intensive branches of industry. The priority task is to step up production and computer technology must serve this. As a result the points of emphasis in use of computer technology are: energy management (primarily the thermal power stations of combines and factories), ship construction and ship repair, agricultural machine manufacture, truck manufacture, machine tool manufacture, the foodstuffs industry, the primary materials industry (chemical industry and metal industry) and the furniture industry.

Conditions for System Marketing:

--hardware which is technically advanced and which can be built up or developed;

--software which can be used easily;

--the possibility of connecting (compatibility) to other computer systems (the points of emphasis are the ES 1022, ES 1035, ES 1040 and ES 1055);

--a flexible and well developed service and customer service.

A few examples of the application of our computers:

The VEB Combine Umformtechnik Erfurt has set up 30 technological work sites equipped with picture screens to improve working conditions for technicians and increase the efficiency of the work.

The VEB Numerik Karl-Marx-Stadt is doing program development for the microprocessor systems of NC machine tools in a time sharing system.

The goal of a task assigned by the government is to develop a computer network at the VEB Combine Schwermaschinenbau "Karl Liebknecht" in Magdeburg between the plants of the combine; it will use ten Videoton computer systems. The task is being carried out on a continuing basis and will be completed in 1990.

They are planning to realize the following tasks:

--complete organization of information for the leadership;

--complete economic data processing in the areas of design, technology and materials management, sport and medium range production planning and financial planning;

--accounting and statistics;

--production planning, guidance and accounting.

Another interesting application area is the airport information and control system at Interflug and the solution of technical transportation problems at the German State Railways and the Ministry of Transportation.

A very important investment has been completed at the VEB Deutfracht Seereederei Rostock. Since July 1983 the ES 1011 computers have been recording and in part controlling the port traffic; Videoton also supplied the user programs for these.

The VEB Combine Fortschritt Landmaschinen (an important shipper to Hungary) was among the first to use computer technology for the rationalization of production. They already have Soviet (ES 1020), GDR (ES 1040 and ES 1055) and Philips computer centers and work on a Videoton project is now under way. They

will put a total of six ES 1011 computer systems into operation in factories around Dresden for production control and warehouse management tasks. The first three ES 1011 systems have been installed with user programs written by Videoton. The ES 1011 computer system, cooperating with VT-20 small computers, actually identical with the systems of the Domus furniture store in Budapest, is used to organize sales and warehouse management at the SHB Mobel in Berlin.

There is another user area at the Meteorologischer Dienst (Potsdam). Here they use two ES 1012 computers for international and domestic message exchange in a message forwarding system. (See the article on page 6 of the May issue of our journal titled "An ES 1012 at the Meteorological Service of the GDR.") Its tasks include receipt, storage, processing and distribution of meteorological information via lines connected to the computers. A joint project is now being worked out within the framework of a competition proposed for developing countries by the UN with hardware provided by Videoton and software provided by the Meteorologischer Dienst.

In the area of health affairs they are solving the following tasks with an ES 1012 computer at the Charitee hospital:

--hospital patients are received, assigned and discharged in the conversational mode;

--processing of registration and diagnosis files;

--drafts of clinical processes and preparation of a register for various patient groups;

--medical research with the aid of mathematical and statistical programs.

It can be seen from the examples on what a broad scale our systems are being used. As we mentioned already, the cutback and tightening up on investment has had an effect, but independent of this we are present in branches (agricultural machine manufacture, transportation, shipping, etc.) which have possibilities for computer technology investments because of their stressed importance. It increases our competitiveness that we now offer sale of complete systems; in addition to providing the hardware we will undertake to develop the user software too. There is a great demand for this in the GDR because they have a narrow capacity and few experts in this field.

Naturally the constant development of our service and customer service, raising the technical level, and putting on the market the new products being manufactured as a result of our technical development (the ES 1011 C new computer system introduced at the Leipzig Fair or the editing display already delivered to the Soviet TASS, for example) are organically linked to our presence on the market, strengthening our positions and increasing the volume of our sales.

Direct and living contact with the users is provided by the regularly held "User Circle" sessions where we exchange ideas concerning certain systems applications and results achieved and by the computer technology symposia within the framework of which we give lectures and, in the course of consultations, offer aid, manufacturer to user and vice versa, for solving problems and for maximum performance of the tasks.

The market presence of Videoton is influenced very favorably by the fact that it has built up a service and customer service base, with a computer center, where software manufacture already has definite significance, in addition to repair and training tasks.

Our Experiences

We must say that on the GDR market, which as is well known poses high requirements, only forward looking commercial work based on the long term will bear fruit.

It is obvious that from the viewpoint of winning customers it is of very great significance that the computers already working have a good reputation. The effect of this is felt not only within a single branch of industry but independent of this as well. The standard in this regard is set especially by those large combines and enterprises (for example, Fortschritt and the Schwermaschinenbau Magdeburg) which are especially "in the public eye." So the task is unambiguous: We must provide correct, precise, high technical level systems which will serve as examples for enterprises intending to use computers.

Remaining in this logical sequence: The customer wants to buy and he submits an official request. The rule is that under 5 million marks the director of the combine (or enterprise) approves the investment; above this amount the ministry does. A detailed study, in general of several hundred pages, must be prepared in which it must be proven why they want to buy a computer, what tasks are to be solved and what advantages can be expected from the computer use. If the investment is authorized they ask for a bid, and at the same time submit to the supplier a task plan in which they set down the hardware and software demands to be made of the computer system. This is very important, because this is the basis for the delivery contract and later for handing over the system!

The essential elements of the phase following this are:

--multiple consultations in both hardware and software questions;

--training of the personnel who will operate the computer, even before installation of the machine;

--clarifying the service and customer service and later, after expiration of the guarantee time, the possibility of signing a contract going beyond the guarantee;

--signing a civil law contract, delivery and installation.

With regard to the investment policy of the GDR it is also a very important factor that the realization time for introducing computer technology systems should be short because they adhere or ask others to adhere strictly to the annual plan for investments.

Cooperation contracts have great significance as a result of the ESZR [Uniform Computer Technology System] program and as a result of specialization agreements.

In May 1983 Videoton signed a coöperation agreement with its largest partner, Robotron. In February of this year the directors general evaluated the status of the themes and simultaneously extended the cooperation to additional areas, partly in regard to computer technology and partly in regard to entertainment electronics.

In sum it can be established that the GDR is a market posing serious, hard technical tasks; by constantly maintaining lively contacts and providing information and with technical development following the development of computer technology we can count on our systems being sought after and respected in the years ahead as well.

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MICROCOMPUTERS, PERIPHERALS, SOFTWARE, TAF NOVELTIES AT BUDAPEST FAIR

Csaba Gergely: "Microcomputers"

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 pp 8-9

[Text] Without doubt 1983 was the year of the microcomputer in our homeland. There were many false ideas and unrealistic expectations in regard to the role and possibilities of microcomputer technology too, but one thing is certain: The broad social interest aroused by microcomputers contributed to a better acceptance of computer technology as a whole. For this reason we awaited this year's Budapest International Fair with interest. In what direction were the developers and manufacturers going? Will we get an answer to several questions which remained open last year (for example, peripheral supply, price level, etc.)?

Well, a visitor to the fair this year had plenty to see and plenty of domestic novelties; indeed, to a certain extent he struggled with the confusion of plenty.

The number of foreign exhibitors was rather small, but it was prestigious. It is enough to refer to the IBM PC (which contrary to expectations was not freed for sale in Hungary at the time of the fair), the similar equipment of ICL or the Alpha Micro AM 1601 and the Logabax 528 system. The latter could be seen at the stand of the SZUV [Computer Technology and Management Organization Enterprise] as possible expansions of the domestic product assortment. (For purposes of information we publish a comparative table of the IBM personal computers.)

The performance of the equipment also moves over a broad band, from simple machines which can be connected to TV and tape recorder (student, game and hobby machines) to high performance professional equipment. Use of the adjective "professional"--it appears--is rather arbitrary, and almost every firm exhibiting microcomputers uses it to describe their products. So it is impossible to tell if an industrial quality display, or the capacity of the processor, or large background storage, or ample software supply, or multiple work sites, or the possibility of linking into a network, or all these together make the machine in question a professional one.

In the low performance category this was the premier of the Primo machine of the Microkey association, after the Aircomp-16 which was known earlier. Some called the Primo the "Hungarian Sinclair," referring not only to its performance

category (it can be obtained in versions with 16, 32 and 48 K bytes of RAM and has BASIC burned into 16 K bytes of ROM) but also to its price, between 10,000 and 20,000 forints. Videoton's TV computer (it is called a hobby computer) is aimed at satisfying similar needs and on the basis of its performance we can also list here the HT-1080Z, very successful school computer (of the Signal Technology Cooperative). We could see many examples in the category of single work site microcomputers with an 8 bit microprocessor, about 64 K bytes of memory, tape cassette and/or floppy disk, built into a display. These included the Rosy-80 microcomputer family of the Rolitron Society, the Comput-80 universal microcomputer family of the Comproject Gmk [economic work group], and machines already known earlier such as the TAP-34 machine of the Telephone Factory (which functions not only locally but also as an intelligent terminal for various computers thanks to its TAF [remote data processing] emulators), the SZKI [Computer Technology Coordination Institute] MO8X, the Syster microcomputer of the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] and the Microkey Limited Liability Company and its larger sister, the Varyter which can be built up to 256 K bytes, the Labsys-80 microcomputer of Labor-MIM [the Laboratory Instrument Industry Works] and the VILATI [Electric Automation Institute] Floppymat-SP. A good number of these machines--the listing is not complete--operate with CP/M or compatible operating systems.

The visitor could also see quite a few machine types moving up the performance scale. Among the 16 bit machines we find here the Proper-16A, which won the grant prize of the Budapest International Fair this year, and a further developed version of it, the Proper-16W. Both are products of the SZKE or its subsidiary enterprises.

The latter designation refers to the possibility of background storage (Winchester) in harmony with the high performance processor. For the time being, unfortunately, the user can get such background storage only from capitalist import. The Proper 16W is made for multiple work site and network use and, together with the 16A, it is compatible with the IBM PC at the BIOS and MSDOS level.

It is gratifying that another computer technology product, the EMG [Electronic Measuring Instruments Factory] 777 graphic calculator, which can be programmed in BASIC, received a fair prize in addition to the Proper.

The next larger category of machines is that of those with two processors: as a 16 bit machine the TPA-Janus can perform the functions of a TPA-11, though of microcomputer size, and as an 8 bit machine it works in a CP/M system. Similarly, the TPA-Quadro can be used as a 12 bit TPA-8 and as a CP/M machine. Their advantage is that they have the peripheral and software possibilities of their predecessors, which were not microprocessor machines.

The VT-16 microcomputer also has two operating modes; in the 8 bit CP/M compatible mode one can run VPPC and VT-20/A programs on it while in the 16 bit mode it is MS-DOS compatible. The VT-32 is built for the multiple terminal mode and for use in local networks. The "supermicro" system of the MTA SZTAKI

represents a very interesting conception; with use of a VME bus and VESTA card system it is possible to develop flexibly the most varied microcomputer configurations (single user, multiple work site, network file server, text processor, etc.).

At the exhibit of the SZAMALK [Computer Technology Applications Enterprise] we could see the first domestic portable professional microcomputer, the TRANSMIC manufactured by the Instrument Technology GMK [economic work group].

On the whole we could see many new things in the micro sphere and we could observe significant progress. From the viewpoint of the market competition situation and the customer market it may appear advantageous that the most varied enterprises, associations and work groups are active in such large numbers (development, manufacture and services). Unfortunately, for the time being, one cannot observe the favorable effect of this on the development of the incomprehensibly high price level. We might note that interdependent with this is the fact that the multiplicity of firms means a certain dispersion of resources, which does not favor economical series size or efficiency. But on the basis of foreign examples we can hope that in the years ahead the sellers (left standing) and the customers will find one another and computer technology on the market, which is certainly an important condition for the development of the spread of electronics and of computer technology applications.

Adam Kis: "Computer Systems"

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 p 8

[Text] The Budapest International Fair showed that the larger category computers and computer systems are being forced into the background--with the appearance of large volumes of microcomputers. The fair always indicates the development of the market, with the sensitivity of a barometer. The narrowing of investment possibilities certainly does not favor the installation of high priced large systems. Only the SZAMALK exhibit offered something new in large computers (the ES 1045, the newest and largest ESZR [Uniform Computer Tnchnology System] model, and the newly acquired Siemens computer of the SZAMALK). The SZAMALK did not offer these machines for sale but rather was demonstrating the possibility of the modern network use of them. Naturally, the terminal of the ES 1045 offered a useful orientation for those who plan to acquire such a computer, for every sign indicates that this model, with an operational memory of 4 M bytes and 100 M byte disk stores, will be the dominant large computer of the years ahead.

The market for minicomputers offers relatively greater interest. Here we found three models worthy of note. All three are real novelties, the fame of which preceded them, and at the fair those interested could compare the realization of the plans with their imaginings. All three models spring from a common root--they were developed on the basis of one each PDP type. Another common aspect of them is that the largest memory size which can be realized on all three is 4 M bytes.

If we can believe the specifications of the manufacturer then the smallest of the three is the Procomp 6 computer of the SZKI. The developer decided that this model would occupy a position between the personal computers and the traditional minicomputers. In our opinion it is a typical minicomputer, the functional possibilities of which are determined primarily by the peripheral assortment. Actually the manufacturer limits the size of the system with this; it is offered with four 20 M byte and four 5 M byte magnetic disks. It is possible to connect 16 terminals. It fits the MSZR [minicomputer system] in both its architecture and its software assortment. Its instruction set corresponds to that of the SM-4. Its chief operating systems are the OSZRV, RAFOSZ and DIAMSZ, known from the SM-4 system.

We saw the "little brother" of the Procomp 6 at the Soviet exhibit. This is the SM-1420, a descendant of the SM-4. It is a significant change, compared to its predecessor, that it is possible to expand the operational memory to 4 M bytes with the aid of a 22 bit memory dispatcher. Its peripheral assortment corresponds to that of the SM-4, and in software also it shows full compatibility from below upwards. The SM-1420 is in commercial trade; the SZAMALK handles its sale in Hungary.

In connection with this it is worthy of note that several people from the SZAMALK put the MAS-M production control system into operation on the SM-1420; adaptation of this system was completed recently. The hardware, the MAS-M and the DOS KP operating system serving this all passed the test outstandingly; the software system started immediately, without problems on the essentially unknown machine after an extraordinarily brief installation time. (This initiative is worthy of mention also because, unfortunately, the computers at the fair exhibits rarely function with real applications systems.)

The largest and most prestigious model in the series of machines reflecting the system philosophy of the MSZR series was the TPA-11/440 of the KFKI [Central Physics Research Institute].

This has a 16 M byte cache memory in addition to the 4 M byte operational memory. The multiple bus system ensures realization of the multi-program, multi-user mode at a high level. The carefully developed diagnostic-error prevention system, supported in a far-reaching way by its system structure, makes possible easy operation and swift correction. We are informed that series manufacture will begin in the near future. News of the machine preceded its appearance; at the fair the developer could take orders for no earlier than 1986, those to be made prior to that already have owners.

We must mention the SM-52 model of Videoton. Although it is not new in itself, it develops every year and provides ever new advantages to users. The novelty this year was a high performance, fast COBOL operator by virtue of which the SM-52 becomes outstandingly suitable for large batched data processing tasks.

Also worthy of mention is the TPA-11/48 system exhibited at the stand of the Struktura Organizational Enterprise; they demonstrated the MINITIP production control system on it.

Despite the relatively narrow offering of computer systems we could note certain progress. In both their operational parameters and their execution the new items approach the similar western machines and to a certain extent they have reduced our backwardness even if they could not put an end to it.

ESZR Peripherals

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 pp 9-10

[Text] New or further developed magnetic disk stores which can be connected to computers of the ESZR and MSZR series could be seen in the offerings of the Soviet Elektronorgtechnika and the Bulgarian Izotimpex. The ES 5080 Soviet and the ES 5067 Bulgarian 200 M byte exchangeable disk drive units coincide in their chief parameters.

The Elorg Enterprise exhibited an ES 7036 line printer with a speed of 800 lines per minute; various circuits to aid checking are built in.

Microperipherals

It was gratifying to see that most of the new Hungarian microcomputers exhibited were equipped with new micro printers of domestic manufacture or from the socialist relationship. The DCD-PRT-80 device of the Datacoop Computer Technology Small Cooperative is a matrix printer developed entirely domestically (see our article on page 5); the TMT-120 printer of the Telephone Factory and the MP 80 printer of the SZKI are made by adapting licenses. Videoton appeared with the VT 21200 and VT 21400 desktop matrix printers manufactured by a domestic mixed enterprise created with an English partner; the outward dimensions and weight of these hardly exceed those of the printers mentioned earlier. The speed of the printers exhibited averages between 80 and 160 characters per second and the number of print positions varies between 80 and 132. Among the socialist countries the Polish Metronex exhibited a further developed version of the D-100 printer of the Mera-Blonie firm and the D-200 mosaic printer which has a speed of 180 characters per second.

The floppy disk store is an important microcomputer peripheral with a future. The Hungarian Optical Works recognized early that the domestic spread of microcomputers would create a great demand for floppy disk stores. In 1983 they shipped almost 17,000 of these products, mostly to domestic and socialist markets. The MF 6400D storage unit using disks with a diameter of 20.3 centimeters, in an IBM compatible form, has a capacity of 500 K bytes in FM coding and 1,000 K bytes in MFM coding. A new product is the MF 4001 mini-floppy store (disks with a diameter of 133.4 mm) which is recommended for use in displays, in commercial and financial terminals, in accounting machines, in text processors and in desktop small and microcomputers. It has a capacity of 250 (FM) and 500 (MFM) K bytes. Another essential advantage is that the height of the device (41 mm) is half the height of the previous MOM [Hungarian Optical Works] minidisk unit. Both peripherals mentioned will go into zero series manufacture this year.

But even after visiting the fair we feel that things are missing. The various models of the "MOM floppy family" which won a prize last year cannot satisfy the demand. The Winchester category, with "professional" capacity, is entirely missing for the time being; the user must rely on chance import possibilities or on minicomputer disk stores which sometimes can be used with microcomputers. We await with interest the outcome of the Winchester development under way at the MOM.

The Budapest Radio Technology Factory exhibited its MCD-1 micro floppy disk drive unit, which for the time being is made only for capitalist export. It has a disk diameter of 72 mm and a storage capacity of 100 K bytes (FM) or 200 K bytes (MFM).

The Bulgarian Izotimpex Foreign Trade Association exhibited the ES 5074 dual floppy disk store (capacity per drive 3.2 M bits) in its BK-1300 microcomputer system.

Of the new design keyboards we might mention the conducting silicon rubber touch and capacitive keyboards of the SZKI and the optical keyboard of Datacoop which operates on a light path matrix principle. The Uniboard capacitive keyboard has a maximum of 128 keys. The infra-light scanning DCD-OT-327 optical keyboard contains modern integrated circuit and optoelectronic elements.

Graphic Displays and Terminals

The TEKEMU high resolution, black-white, raster graphic terminal developed in the MTA SZTAKI was prepared basically to replace the Tektronix 401X series displays. The device will be manufactured by the Signal Technology Cooperative. The number of pixels visible on the 48 cm screen is 768 x 1,024. Another new developmental achievement of the SZTAKI is the GD85 TEXPRO high resolution text and figure editing station, which is recommended for press and editorial applications, for example. The black-white, raster screen has a fixed rectangle format and contains 1,024 x 768 visible pixels.

The Personal Agroelectronics GT exhibited a black-white graphic terminal. The URD-85 device containing 256 x 256 raster points displays pictures on a television screen via the video input developed. The picture quality is thus substantially better compared to RF feed.

Orion exhibited a prototype for color graphic displays. Color selection on the OCD-500 device is from 64 colors and 16 colors can be displayed on the screen simultaneously. One can change the size and color of the characters, displayed vertically or slanting, the color of the background can be modified and optional enclosed areas can be recolored. The firmware of the device, which is basically compatible with the Tektronix 4010 and similar displays, makes it possible to run high level graphic program packages, for example PLOT-10 or EDUCAD, on the source computer. Visitors to the fair could see the device in operation connected to the TPA-11/440 megamini computer of the KFKI via a KFKI Janus microcomputer.

The prototype of the VDC 52700 color graphic display terminal of Videoton has 512 x 256 visible pixels and can display eight colors simultaneously. They are developing a fast cursor moving device (mouse) via a V.24/V.28 interface.

The Datagraph firm in the FRG exhibited VTC 8001 and VTC 8002 type Tektronix compatible color graphic display terminals. The VTC 8002 16 bit microprocessor device can display 16-256 colors simultaneously, depending on storage capacity, and the number of visible pixels is 640 x 480. Further advantages are zoom function and a vertical-horizontal soft rolling function.

Nikifor Mihajlov: "Software Products"

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 p 10

[Text] If we were to characterize the software offerings at this year's Budapest International Fair with one sentence we might say that the process of software products becoming a commodity has been completed. We noted with pleasure that most of the foreign and domestic computer technology exhibitors gave attention not only to showing their hardware devices but also tried to give a taste of their ever expanding software offerings as well. The slogan of the SZKI ("And this tree will grow") characterized--if unintentionally--not only the software for the machines sold by it and its subsidiaries but also the developmental trend of Hungarian computer technology as a whole.

To stick with the SZKI, one of the most endearing aspects of the advertising campaign for the Proper professional personal computer family is the ample offering of software which embraces virtually every applications area from program development all the way to enterprise guidance systems.

Of the software products exhibited at the fair two product groups merit special mention--the mushrooming general and concrete purpose applications program packages which can be run on microcomputers and the terminal emulators aiding development of computer networks. Virtually every domestic exhibitor showed microcomputer programs--KSH SZUV [Central Statistics Office, Computer Technology and Management Organization Enterprise] for the Commodore-64, the TAP-34 and the Logabax 528, Comporgan for the Commodore-64, SZAMALK for the Transmicre and Commodore-64, the KFKI for the TPA-Quadro, the VBKM [Electrical Equipment and Appliance Works] and Comproject for the Comput-80, Videoton for the VT-16, etc.

One novelty at the Budapest fair was a publication titled "Domestic Software Supply for Microcomputers '84" published under the supervision of the main computer technology applications department of the KSH.

A breakthrough was finally attained in the area of remote processing systems and software products aiding development of computer nets. Today every computer worth anything has the hardware and software tools which make possible machine-terminal or machine-machine links. There is an ample supply of software elements ensuring emulation of various types of terminals. At the SZAMALK stand the OSAK demonstrated a Commodore-64 operating as a VT-52; it was linked with the SM-4 computer on Vahot Street. The microcomputer was operating as a query terminal for the Soviet SETOR database management system recently purchased.

At the Soviet stand, on an SM-1420 computer installed by the Elektronorgtecheika foreign trade enterprise, one could see the SETOR database management system, which was running with an OS-RV/E operating system. Another interesting item at the Soviet stand was the AVESTA conversational information system, for the storage and retrieval of thermophysical data. It is sold by Licenzintorg.

At the Bulgarian stand there was an exhibit of the ISSES foreign trade enterprise, the chief profile of which is sale of software products and services. The products offered for delivery included the SETOR-SM-QUERY system, the SETOR database management system, the DIONIS ESZR conversational information query system, the MIKRO-INFO information retrieval system for microcomputers and the MINI PROTEE program development technology.

The Struktura Organizational Enterprise exhibited online and distributed database versions of the TIR production control system developed for ESZR computers.

This year's Budapest International Fair again brought to the surface a few old deficiencies of domestic software development activity. One problem--exclusively one for the fair--is that a software product is still not such a spectacle that it is worth showing independently--as, for example, a computer. Virtually nowhere did they provide documentation for the software products, which may suggest the substantive deficiencies of the documentation or--and this is more probable--the poor press quality of the documentation. It appears, after viewing the fair, that software is still a "soft" commodity which can be sold only as a "necessary" adjunct to a computer. With all respect to the exceptions.

Finally, a few words about prices. In an interesting way the prices for ESZR software products are substantially lower than the prices which have developed on the western software markets. In the minicomputer category (SM-4, TPA-11, SM-52) the prices are almost the same, but the prices for products which can be run on microcomputers--despite a wide spread--are at least 40-50 percent higher than the world market prices.

Laszlo Kovacs: "TAF Novelties"

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 p 10

[Text] At the SZKI they have prepared a program package for the Proper-16/A personal computer which offers IBM 3780 terminal emulation. They will soon offer a 3270 series emulator also which, thanks to the hardware possibilities of the machine, will make possible the concentration of a group consisting of 12-18 terminals for an IBM or ESZR central function computer. The basic software and the model applications being prepared for it will make possible operation of the terminals through preprocessing which exploits well the capacity of the Proper-16/A.

This same personal computer will probably be one of the most significant representatives of the closed videotex systems of the near future. In connection with this we will see local network solutions, support for connected line access and terminal concentration in the direction of a computer providing the central function. It is an interesting aspect of the latter that the videotex terminals can be operated together with terminals with different display formats within one group.

At the Videoton stand we could see an independent terminal group controller. The VDN 52576 equipment connects a maximum of eight display terminals or printers to an IBM or ESZR central function computer on data transmission lines with a transmission speed of 7,200-9,600 bits per second. It is suitable for two types of data transmission terminal operation--IBM 3276/BSC or SNA/SDLC. The display terminals which can be connected are members of the very popular VDN series which have favorable ergonomic characteristics.

At the stand of the Telephone Factory they provided information about realization of a TAP-34 terminal emulation offering IBM 3275 compatibility.

At the stand of the KFKI, which has great experience in the area of IBM-ESZR terminal group controls, we heard that the newly developed Quadro is also suitable for concentration of a maximum of five terminals according to the 3270 protocol. According to what we were told they are preparing hardware and software tools for the ETHERNET local network system.

At the SZTAKI and Tektronix stands we could see one realization each of a GKS [Graphical Kernel System] integrating graphic picture description. The significance of this system is still relatively difficult to appreciate. To an outside observer it may appear basically that it will be used primarily in the area of professional CAD applications. But it could play a very large role from the viewpoint of TAF [remote data processing] at the same time, since in the vector graphics option of the videotex display procedure to be introduced in Europe the developers are relying on the GKS. Thus eventually the more developed alphamosaic terminals replacing the now very widespread Prestel basic terminals will be expanded with this. This will create the largest TAF systems; that is, users of the public videotex services will be able to get all the advantages of a uniform graphics portrayal. Experts from the SZTAKI adapted user programs using GKS to the already described TEKEMU via software products with the RGKS and XGKS trademark (which can be used by RSZ-11M and UNIX respectively).

Tektronix went one step further and exhibited a system serving demonstration purposes in which separate, microprocessor controlled special purpose hardware realizes the GKS routines.

One of the newest products of the Philips firm is also related to videotex. This is the EUROM card which provides character generation functions for the European alphamosaic display procedure mentioned above. On the basis of its capabilities we can regard it as the most developed character oriented display in the world today.

At the Orion stand we could become acquainted with a prototype of the VTX-960 videotex terminal. The terminal family consists of devices with various functions and prices from simple user terminals to editing terminals which can be used for information input purposes as well. The built-in RAM memory can store four pages of information, but the data received can also be recorded with a (cassette) tape recorder to be played back and displayed later. It can store

ten telephone numbers; five of these are preprogrammed at the factory and five can be selected as desired and entered with a keyboard. The terminal automatically dials the stored telephone numbers. (See our previous issue for a detailed description of the VTX-960).

At the SZUV stand we could see an example of a query application of the videotex terminals manufactured by Orion earlier. With the terminal one could access the SZUV computer center in Kaposvar by long distance.

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DATA PROCESSING EQUIPMENT AT MINISTRY OF AGRICULTURE

Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 pp 1-2

[Unsigned article: "MEM STAGEK, An Outstanding Institute"]

[Text] The Statistical and Economic Analysis Center of the Ministry of Agriculture and Food (MEM STAGEK) won the distinctive title of Outstanding Institute for the sixth time for its work in 1983.

The planning and economic analysis work, the cost and price analysis work and the number of related computer technology tasks in the institute increased further in 1983 as compared to earlier years. For example it was especially important to prepare analyses serving as a basis for up-to-date status reports on problems caused by the drought period, for guidance and swift measures. The stressed tasks included--among other things--an evaluation of the effect of the regulator modifications, preparing foodstuffs economy development forecasts and economic analyses and calculations for the developmental programs starting with World Bank credit.

The development of the composition of the completed processing well illustrates the importance of the computer in agricultural guidance and preparation of decisions; complex economic calculations make up 67 percent, modelling tasks make up 16 percent, mathematical-statistical processing makes up 7 percent and data processing makes up 10 percent.

Last year they worked nearly 5,000 hours with the IBM 360/40 computer which has been in operation since 1972. The workers at STAGEK could combine the outstanding institute celebration held in the middle of May with the taking over of the IBM 370/138 computer too; this will provide even swifter, more precise satisfaction of the operational requirements.

Batched processing and magnetic tape retrieval of the large volume of data collected required a great deal of time, so they are switching to magnetic disk data storage and on-line querying. In the future programming also will be in the conversational form. They are now working on building the magnetic disk database. The new system operates with a 1 M byte central unit, six 100 M byte and three 29 M byte magnetic disk units, six magnetic tape units and a DOS/VS/E operating system. In the near future they will install, in addition to the 10 terminals which exist already, another six terminals for conversational program development; after completion of the database these will make possible on-line querying for colleagues of the ministry doing analytical work.

At the intimate celebration which was attended by state and economic leaders--Dr Miklos Villanyi, deputy minister, Dr Imre Szabo, deputy minister, and Dr Laszlo Nemeti, director-in-chief of the MEM STAGEK--Lajos Pesti, deputy chairman of the Central Statistics Office, used the adjectives practical, solid, clever, useful and careful to describe the computer technology applications work of the Ministry of Agriculture and Food. He said that the State Planning Committee and the government were taking a firm and committed stand on behalf of information development in the Seventh 5-Year Plan. After working out a developmental concept for computer technology informatics a concrete program will be developed quickly; it will be a novel feature of this that the State Planning Committee will deal separately with the programs of the several ministries.

In his speech Dr Miklos Villanyi emphasized a qualitative improvement of the data services making high level decisions more effective, instead of simply providing more data.

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SHORTAGE OF MODERN INSTRUMENTS AT RESEARCH INSTITUTE DEPLORED

Budapest MAGYAR TUDOMANY in Hungarian No 7/8, Jul/Aug 84 pp 575-586

[Contributions from a number of institute officials: "Timely Problems; Concerning Instrument Supply for Academy Institutes; A Critical Situation"]

[Text] In the past months the leaders of the Central Office of the MTA [Hungarian Academy of Sciences] made a tour of the technical and natural science research institutes of the academy. In the course of the conversations--in addition to describing research results and plans--the institute leaders unanimously called attention to the serious problems of supplying instruments for domestic basic research; in places they called attention to a critical situation. We asked the leaders of six of our most important institutes to express their opinions, by answering the questions of the editors, to outline the situation at their own research sites and give their ideas about a solution. These were: Denes Berenyi, corresponding member, director of the Nuclear Research Institute; Lajos Keszthelyi, corresponding member, director of the Biophysics Institute of the SZBK (Szeged Biology Center); Ferenc Marta, member, director in chief of the Central Chemical Research Institute [KKKI]; Zoltan Szatmary, candidate in physical sciences, deputy director of the Atomic Energy Research Institute of the KFKI (Central Physics Research Institute); Karoly Szego, candidate in physical sciences, director of the Particle and Nuclear Physics Research Institute of the KFKI; and Tibor Vamos, member, director of the Computer Technology and Automation Research Institute. Finally, Istvan Lang, corresponding member and deputy first secretary of the MTA, gives a general picture--on the basis of the answers received--and sums up the problems, possibilities and ideas affecting the entire academy research network and the science policy of our country.

1. How Do You Judge Instrument Supply At Your Own Institute?

Denes Berenyi: Instrument supply at our institute is almost catastrophic. Taking into consideration the official annual depreciation ratio of the academy, the net value of our machines and instruments at the end of 1983 was 50.3 percent. And this value is decreasing yearly (56.6 percent in 1981, 52.3 percent in 1982). The actual situation is much worse that this. In the last 3 years, as an average, the value of 4 million forints' worth of our instruments decreased to zero each year, and our supply of instruments "increased" by re-evaluating these. By way of comparison: in the 3 years from 1981 to 1983 the institute received about 4.2 million forints per year for acquisition of new instruments and machines.

The reason I said "almost" in the first sentence is that our institute traditionally conducts instrument development and construction activity too. Without this our situation would be truly catastrophic.

Lajos Keszthelyi: The SZBK of the MTA is a relatively young research institute. Its present scientific profile developed in the 1970's. Its themes were selected from the area of modern molecular biology, which proved very fortunate because, coinciding with the gigantic development which started throughout the world, it became the foundation for biotechnological development work.

The instrument park of the center developed from three sources:

1. Instruments taken over from a few research institutes when it was formed (for example, a scintillation counter, a spectrophotometer). These still exist, but being 15-20 years old they are very obsolete both theoretically and from the viewpoint of their operability. They have avoided being scrapped thus far only because even in this condition they help solve tasks. But this indispensable help costs a great deal in parts and in live work.

2. From 1971-1972 to 1978 the center, just getting started, received emergency support from the investment allocation of the academy. In this way we were able to obtain the most necessary tools.

3. The 5-year UNDP [United Nations Development Program] project of the center (1973-1978) meant especially much in tooling up in regard to instrument supply; within the framework of this we were able to obtain a number of large instruments, too, (electron microscope with microprobe, laser-Raman spectrometer, scintillation counters, phytotrons, etc.)

We can say that in 1978 the SZBK was a research center "relatively" well supplied with instruments for molecular biology research. The work "relatively" applied to domestic institutes and the institutes of the socialist countries; indeed, even in regard to Western research sites, the supply of instruments of an interdisciplinary character concentrated in one research site appears advantageous.

Unfortunately this good situation does not exist at all today. There was no possibility in the 1980's to further develop or modernize the instrument park. A narrowing of the investment allocations was visible even in 1978 with the end of normal supply, so at the center we turned our narrow material resources to acquiring the most necessary basic instruments. We developed a common instrument park consisting of centrifuge, spectrometer and scintillation counter; we organized material and parts supply for these and--where it appeared necessary--we organized in-house service.

In this way, we succeeded in avoiding greater hangups in the area of the basic instruments most necessary for biological research. Naturally, in some institutes of the center the aging or shortage of special instruments and the fact that we simply were not able to keep up with development represented an almost insuperable problem. Our instruments are 6-10 years old and frequently fail.

The central instruments are very much overburdened. We can say in general terms that we use our instruments to the limit of their capacity and if one or another of them drops out then the research work stops too. Keeping in operation the electron microscope which was acquired 10 years ago, and was then all-powerful, now represents an annual repair cost of 300,000-400,000 forints.

A new problem appeared in 1983-1984. Recognizing the importance of biotechnology, the academy provided a somewhat more advantageous investment possibility for acquisition of special instruments. We thought--naturally--that it was worth spending money only on the most developed instruments working with microprocessor technology. We found to our sorrow that because of the embargo these instruments would reach our laboratories only with a great delay, or not at all. A technological change has taken place in the area of biological instruments, too; manual instruments have been replaced by microprocessor-controlled instruments tied to a computer. Our instrument park--despite our efforts--is still at the manual level. This fact is appearing as the newest problem. For us every achievement costs very much in human work....

Ferenc Marta: Among the tasks defined in the charter of the KKKI of the MTA is the task of adapting and spreading in our homeland the large instrument methods used in chemical research. This pertains primarily to material and molecular structure research techniques. For example, the researchers of the institute were the first in our homeland to deal with mass spectrometric (MS), nuclear magnetic resonance spectroscopic (NMR), single-crystal diffraction (X-ray diffraction) and infrared spectrometric (IR) molecular structure study procedures. The researchers working in the areas mentioned have achieved and are achieving scientific results which are recognized even internationally. We have had a large part in the fact that these devices are used in a number of places in our homeland routinely or scientifically. In 1978, we succeeded in acquiring a Fourier-transformation infrared spectrometer connected with a gas chromatograph, which was then the most modern at the world level, and an automatic-measuring and data-processing single-crystal diffractometer.

In the years after that we were not able to get large instruments. Our backwardness in this area is greatest in the NMR technique, because our existing equipment (100 MHz) is already 10 years old. When it was acquired it could be regarded as a top device; now it is suitable for only routine measurements. The most modern 400-600 MHz NMR devices today could start new research trends in our homeland in chemistry and biology and even in solid-body research. By discovering the causes of certain pathological processes taking place in living organisms, they could give new possibilities for pharmaceutical research. Our MS equipment is not modern, but by renovating its electronics and supplementing it with a computer we have succeeded in extending its useful life. On the basis of what has been said, it can be established that in the area of large instruments to study structure we have not been able to keep up with international development. But our backwardness can even be felt in the domestic relationship, too, for there are producing enterprises which have devices (for example, in the area of NMR equipment) which are much more modern than those of the institute.

Development on our own can be realized to only a very limited extent in the areas mentioned because of the character of the technology.

The primary task of the researchers of the institute is to keep up with the world level by developing methods and working out ever-new techniques. At present we can meet this task only with great difficulty, with the aid of extensive international cooperation--for example, by virtue of measurements made abroad.

The institute has traditions of decades standing, a research culture and internationally recognized achievements in the area of kinetic and catalytic research. At the same time we do not have equipment suitable for the surface investigations indispensable in heterogeneous catalysis. This fact not only influences disadvantageously our basic research achievements, it also has an effect on fulfillment of our industrial commissions. Working out material- and energy-saving technologies with new types of catalysts absolutely requires the use of modern ESC-EDAX equipment.

Our supply of instruments in the middle category is deficient and not satisfactory. (This means equipment costing about $10,000-50,000 and would include separation technology devices, for example, gas and fluid chromatographs and UV spectrometers.) In this area, too, there has been great development in the past 5 years, primarily due to the general spread of microprocessors. In gas chromatography, for example, the spread of quartz capillary columns and in fluid chromatography the spread of "microbore" columns has made the older equipment obsolete in part. In any case, the backwardness of the instrument industry of the socialist countries is general in this area.

The lack of laboratory tools and equipment (for example, rotation evaporators) represents a special problem. These tools, not very expensive, are indispensable for organic chemistry preparative work. They cannot be obtained or can hardly be obtained from socialist import. Because of the great demand, these tools wear out relatively quickly, the lack of them can be felt more and more, and they can be replaced only by spending an increased amount of live work.

Karoly Szego: The stereotype answer to the question is: Our supply of instruments is bad. It is easy to support this with figures too, if we compare the gross value with the present actual value. It is more difficult to answer if we try to say to what or to whom we are comparing our situation. We can choose from among the following:

--We can compare ourselves with those laboratories with which we must compete. Compared to them, our backwardness is virtually impossible to overcome; but the distance is not so great between our scientific achievements.

--We can test the differences in level by "normalizing" the differences between national incomes. Then it is probably true that that research which uses the electronics and computer technology prepared by the KFKI is not so bad off; that which uses other equipment to a significant degree, whether it be a large computer, large equipment or special small instruments, is in a bad situation.

--It is most difficult to judge how much better off we would be if the approved financial plans were actually realized, if a part of the money was not taken

away in the meantime, if the use of the other part were not hindered artificially, if, in the final analysis, acquisition were not made in a completely haphazard manner. (Being materialists we cannot say, "The Lord giveth, the Lord taketh away, blessed be the name of the Lord.") I believe that a planned spending of the money would increase our achievements many times. So I am saddest if I compare where we are to where we might be, spending the same amount of money.

Zoltan Szatmary: The supply of instruments for the institute is rather weak compared to the tasks and to the world level, but it can be called average for domestic conditions.

Tibor Vamos: The supply of instruments for the institute is beginning to be catastrophic. By catastrophic I mean that it makes research being conducted in an international competition more and more impossible. The gross value of the instrument park of the institute is 90.8 million forints. The net value of the instrument park is 45.7 million forints. Considering that about 450 people use the instrument park the per capita instrument value is 201,800 forints (thus the net instrument value per capita is 101,700 forints). The average age of the instruments is more than 6 years. We have used the narrow foreign exchange funds provided the institute, primarily from external sources, for computer acquisition or to buy peripherals, so we have been practically unable to acquire instruments. Filling the orders takes 2-3 years, and only with an extraordinary investigative apparatus can one discover where each order is hung up. Special personnel should be provided for this purpose.

2. In Regard to the Large Instruments Used in the Institute, What Is the Average Theoretical Obsolescence Time Calculated in the World?

Denes Berenyi: The obsolescence time differs greatly by instrument type. For accelerators it is 15-20 years, for spectrometers (X-ray, electron, etc.) it is 10-15 years, for electronic and computer technology equipment it is 5-7 years.

Lajos Keszthelyi: The problem of theoretical obsolescence is appearing now very sharply. The technological change mentioned earlier--microprocessor control, computer links--actually makes every instrument older than 5-6 years theoretically obsolete. The new instruments are substantially more precise, they work automatically, the processing of the data is done with computers. All this makes possible the solution of problems which were believed unapproachable earlier (for example, sequencing the nucleic acids, recognizing homologies or evaluating the results of two dimensional electrophoresis).

There has been gigantic development in the area of equipment serving to separate biological materials, too. For example, avoiding the theoretical obsolescence of the centrifuge park is running into great difficulties. Seeing the swift development of biotechnology, it is not difficult to predict that even instruments which may be modern today will be theoretically obsolete in only a few years.

Ferenc Marta: The average obsolescence time for large instruments can be put at about 5-6 years. It is characteristic that in most cases the manufacturers will supply parts and accessories for only 5 years. Since the manufacturing time for an instrument type is hardly more than 3-4 years, 6 years surely means intellectual obsolescence. Of course this does not mean that the instrument cannot be used after 6 years, but it will be achieving relatively fewer or weaker quality results. At the same time the necessary work expenditure increases. In some cases, it is possible to make older instruments suitable for further use by fairly large-scale renovation of them. An example of this is the remodelling of the mass spectrometer done several years ago.

Obsolescence is faster for computers: a significant spread of more modern, newer types can take barely 2-3 years. In general, the theoretical obsolescence of medium category and smaller value equipment takes longer than this. Frequently, it is possible to make a relative improvement in power of significant magnitude--primarily, for example, by adding microprocessors. But development--and thus obsolescence--is fast in some special areas, for example, most recently in separation techniques.

Zoltan Szatmary: The use of large instruments is not characteristic because of the nature of the work being done at the institute (and there are few of them). Those we do have were not really modern when they were acquired. These (also) are frequently replaced in the richer, leading institutes in the world, because theoretical obsolescence is very fast. For us, it would be entirely acceptable if we were able to buy truly modern equipment from time to time; then we could use them a good bit beyond the generally accepted obsolescence time. It is not the theoretical obsolescence of our existing tools that causes the problem, but rather that entire categories of equipment on which new methods and themes are being built in the world do not even appear here, many of us hardly even know about them.

Karoly Szego: The theoretical obsolescence time for computer technology devices is 2-3 years. (Under current acquisition conditions, this means that by the time a piece of equipment arrives it is already obsolete!) The obsolescence time for general purpose equipment is 5-7 years, but it can be put at 10-15 years for accelerator equipment and similar large equipment.

Tibor Vamos: The international obsolescence time is 5 years, so we have practically no modern instruments.

3. To What Extent Were the Parts and Materials Needed for Maintenance of Existing Instruments Provided in 1984?

Denes Berenyi: The year 1984 seems somewhat better than preceding years from the viewpoint of parts supply. It is true that the allocation is smaller, but we got it in time; indeed we received an advance in the fall of the preceding year (the possibility of preordering). This momentum is especially important.

But for our institute, parts supply is important not only and not even primarily from the viewpoint of "maintaining the existing instruments" but

rather--as I emphasized in connection with the first question also--from the viewpoint of the instrument development and instrument construction taking place in the institute. This activity is of great significance not only from the viewpoint of the needs of our own institute but also in a broader sphere, in a number of areas of Hungarian research and even practice. Unfortunately, the supply of parts cannot be called satisfactory if we keep these tasks in view. At the same time, I should note that as an average the ratio of capitalist parts in the equipment developed and built by us is 5 percent, compared to the price of the finished instrument, which cannot be regarded as high.

And I must say that if the issuing of KKM [Ministry of Foreign Trade] permits again drags out and delays the acquisition of parts in the capitalist relationship as in previous years it will have a truly catastrophic effect--after the chaotic parts acquisition conditions of the recent past--not only from the viewpoint of maintenance of existing instruments but also from the viewpoint of general instrument supply.

Lajos Keszthelyi: Since its founding, a technical group has been working in the SZBK which repairs instruments which do not have service contracts. Thus far and in 1984, too, the foreign exchange has been available for the most necessary parts--with a few exceptions. We do not expect large problems in connection with the most frequently used instruments in 1984 as a result of these two factors. Again, the price of the relative freedom from problems is very much live work, which rises to the level necessary for required developmental work.

Ferenc Marta: The supply of capitalist spare parts needed to maintain and operate the instruments improved somewhat in 1984. In 1982, the acquisition stop and withdrawal of funds made the acquisition of parts largely impossible. But it is questionable whether we will be able to use this year's allocations in time. The time to put through orders is so long (generally more than a year!) that an unexpected failure or the dropping out of units which cannot be held in reserve causes long downtime. The possibility of immediate acquisition should certainly be provided in urgent cases!

The situation is especially difficult in importing parts and accessories from socialist countries. We cannot get some spare parts, not because of material problems, but because of organizational ones. Many firms simply do not deliver at all or do so with several years delay; it is in vain that we order the necessary equipment.

It represents waste for the country and for the institute that we are forced to order many parts several years in advance because of the intolerably long filling times for orders. It is a loss because it may happen that the instrument or the already acquired subunit will become obsolete or go to pieces in the meantime--or it may not be needed during the life of the instrument. Not even to speak of what losses there are to scientific research with the stoppage of the equipment, or to the producing enterprises because the commissions are not fulfilled. Naturally what has been said applies not only to instrument supply but similarly to the supply of materials and chemicals. The long

time it takes to fill orders does not derive from the fact that the institute is slow to prepare a list of needs or that the foreign capitalist firm does not ship within a few weeks; rather it is official authorization here at home that takes such a long time (despite already approved allocations, too!). Because of the foregoing at least a part of the allocation should be released for immediate use; they should not hold back the entire sum because of import authorizations, harmonization, etc.!

Zoltan Szatmary: We are able to obtain many of the materials and parts needed to maintain existing instruments. But if something must be repaired urgently it is always very difficult or simply impossible because of the slowness of administration and acquisition.

Karoly Szego: The situation is satisfactory for instruments of Western manufacture--if there is a domestic service network. If we must send the instrument to the manufacturing firm, the elapsed time is extraordinarily long (about 1 year). In a curious way the repair of instruments of domestic manufacture is also very slow. The service situation for instruments of socialist manufacture is bad; it is best to set up for in-house repair. In the case of Western small computers (for example the PDP-11/40) the needed service simply is not provided; there is the necessary foreign exchange cover for maintenance in 1984.

Tibor Vamos: The foreign exchange allocations needed to maintain instruments decrease year after year in absolute and relative value; the acquisition difficulties increase partly because of the domestic bureaucracy and partly because of obstacles on the capitalist market (embargo, the longer delivery times due to the boom taking place as a result of technical development). Repair conditions for instruments have deteriorated; on the one hand, the necessary work can be done only very expensively and, on the other hand, (the turnaround) time has increased due to the general aging of the instrument park.

4. How Do You View the Status of the Computerization of Research Taking Place in the Academy?

Denes Berenyi: I do not consider the computer situation at all satisfactory in regard to the academy. The backwardness keeps on increasing. The central machines are not sufficient in regard to either their volume or their access possibilities. The computer park in the several institutes is increasingly obsolete. There is definitely a need for a breakthrough in this area in the next 5-year plan if we do not want to get into a hopelessly backward situation.

Lajos Keszthelyi: Computerization started in the SZBK in 1978 when a TPA-1140 small computer was put into operation. Since then the machine has become a central unit with a satisfactory peripheral assortment. We have also realized on-line connection of 3-4 measuring instruments with CAMAC units. We developed the necessary software as well. We can say that we have taken the first steps in the area of operating a few biological measurement systems with a computer. We feel that the programs we have developed to handle DNA, RNA sequences are especially valuable. In the last 2 years, personal computers

have also come into the center; we bought primarily Sinclair and Commodore models. With their use we have already automated some measurements and procedures (for example, pH measurement), but very much remains to be done. For more demanding computations we turn to the computer of the JATE [Attila Jozsef Science University] Cybernetics Laboratory. For the time being no need has arisen in the center to establish a terminal linked to the large computer of the academy.

Ferenc Marta: The situation of computerization in the area of the MTA is most heterogeneous. In regard to hardware, our supply of large computers cannot be called good. The IBM 3031 machine of the MTA is today already in only the medium category. The supply of medium or small computers varies from institute to institute and from research unit to research unit. The problem of software is a separate question requiring separate analysis, in every branch of research, partly in regard to operating systems and computer programs and partly in regard to the spread of computer culture.

The present computers of the academy are not adequate in regard to either memory size or operating speed for research in chemistry or marginal areas (for example, in quantum chemistry). For this research, we use larger computer technology equipment with the aid of international cooperation. Dedicated computers are already used for the large instruments. In general we purchase these together with the equipment.

A backwardness of significant scale internationally is appearing in the control and automation of measurements and procedures--and even manufacture. For example, in the MTA KKKI there are hardly any special-purpose computers, not even a chromatographic integrator. One reason for this is that the price of small computers is set unjustifiably high. This also applies to devices originating from (private) import (because of the unjustifiably high duty). It is inexpedient to hold back the development of domestic computerization in this way. Let it be added that this fact--as in the case of the relative shortage of computers--again only requires increased expenditure of live work. The linking of units of different types, building them into a common system, which can be realized only by virtue of efforts at the research level, represents a special problem. We worked out a computer technology development conception for the MTA KKKI in 1978. The restriction on investments slowed the realization of this development; indeed, for a long time it postponed it. Creating a network, in which we had intended to use a domestic computer as the central unit, will be realized in 1985 at the soonest, instead of in 1981. Unfortunately this means that this "node" computer which has been working as an intelligent terminal, which was relatively modern in 1980, will be completely obsolete.

Zoltan Szatmary: The computer supply of the academy lags far behind what is needed and probably far behind the possible level also.

Karoly Szego: In regard to large computers, the KFKI is almost at the zero level. At present our "big computer" (an R-40) has long been unable to satisfy the needs. We know that the R-45 machine being purchased to replace it will not be satisfactory either, but there is no other. The computer

capacity of the KFKI lags by about 2-3 orders of magnitude behind that of an average Western institute of similar size. In the case of minicomputers, I consider the situation of the KFKI RMKI [Particle and Nuclear Physics Research Institute] to be good to medium, but personal computers count as a shortage item. It is true that we are not buying them because their software background is not satisfactory.

Tibor Vamos: The situation of the computerization of research taking place in the academy is also catastrophic. The supply of computers for the entire academy is already weaker than that of one better Western European faculty. The so-called central computer, the IBM 3031, is a medium machine which has not been manufactured for a long time and its configuration is especially weak for embargo reasons. The computer technology background of the academy should be greater by at least one and a one-half orders of magnitude. At present, the ability of socialist countries to make deliveries does not make a rational expansion possible and we cannot expand from capitalist imports because of embargo and foreign exchange reasons. An idea is being worked out which would satisfy some of the needs with worksite stations based on a network; this could be realized in Hungary by concentrating the considerable developmental resources of the academy. Naturally this also would require the import of parts and peripherals (primarily magnetic disk stores). Nor can we give up a renovation of the existing machine park, expanding it as possible (new central memory and magnetic disk stores, and possibly ESZR [Uniform Computer Technology System] machines). This is the primary obstacle to computerization in the academy today; the demand and the user culture far exceed the possibilities.

5. What Would You Do, if You Had a Free Hand, To Solve Instrument Supply for the Academy Research Network, Taking Into Consideration the Present Economic Circumstances?

Denes Berenyi: I do not believe that instrument supply for the academy research network could be solved in any way under the "present economic circumstances." This means that if we even want to maintain our level or only to approach doing so, then substantially greater sums from the national income (in both forints and foreign exchange) must be devoted to instrument supply for research in general, but especially for academy research. It is my conviction that this is in the interest not only of Hungarian science but, going beyond this in the long term, of the Hungarian economy and of the entire Hungarian society.

But if something can and must be done in this matter then, in my opinion, it is the following:

--basic, and primarily computer technology, instrument supply must be ensured first, and

--we must support with every means those institutes which deal with instrument development and construction; we must remove every difficulty in regard to our parts supply. Problems should not be permitted in the area of parts supply. This is a minimal requirement.

We must emphasize the supply of basic instruments because what instrument development activity here at home is directed at is not a matter of indifference. We can regard as optimal only the development of really new instruments and methods, especially those which are new in principle. Results achieved in the latter area in our institute, for example, are evaluated just as new achievements pertaining to natural phenomena. Instruments and methods which are new in principle open new paths for the discovery of natural phenomena.

Lajos Keszthelyi: First of all, I would start from the premise that the real problem to be solved is the restriction on investments requiring foreign exchange, and to a lesser extent the shortage of forint allocations. Price increases and changes in the rate of exchange significantly reduce the foreign exchange allocation even within a single economic year. So we absolutely must shorten the administrative throughput time for investments. We must see to it that the institutes can use the foreign exchange allocations directly.

We should institutionalize the practice, more or less followed, that instruments can be purchased from the money intended for savings by academy workers undertaking work in the West or on scholarships; these instruments should be transferred to the institutes for forints. This would aid the acquisition of smaller instruments and personal computers.

The above two ideas are a function of factors outside the academy. It is probably that progress is not a simple task. I think, however, that we might do much within the academy, too, to improve the instrument situation. I am thinking primarily of the institutional economic work groups [IGMK's] which have been formed in various research institutes. Their activity might be used advantageously for the improvement of instrument supply in the following areas:

--Service for broken instruments. Making repair within the framework of the IGMK's into a business activity could represent a profit for both sides.

--Many academy institutes deal with instrument development. Since the institutes make instruments primarily for their own purposes, a large capacity is not available to satisfy the needs of other institutes. The IGMK could help.

--The IGMK could be entrusted with development of certain instrument types, although the objection is recognized that development on one's own is always more expensive than buying finished equipment. The present economic circumstances, however, force us in this direction. I could imagine that we might segregate a certain sum in the academy--in part covered by foreign exchange--from which the institutes, in agreement with an IGMK, might finance the development of more valuable, important instruments and the preparation of prototypes.

--The cheap personal computers are outstandingly suitable for computerized control of measurement equipment and collection of data. Putting them to work is hindered in very many institutes by the shortage of workers trained in this theme. The activity of the IGMK's might "modernize" very many of our instruments.

It appears from the above that I am expecting the IGMK's to influence the instrument supply of our research institutes to a significant degree by making use of the knowledge accumulated over long years. I would be happy to see a broad information service about the already existing IGMK's, about their profiles and capacities.

Ferenc Marta: The present economic circumstances do not make possible the acquisition of instruments to the desired degree. The little money available must be distributed a good bit more rationally than it has been. But this question is interdependent with a number or organizational problems--and some of these go beyond the MTA area--which it is impossible to touch on here. I might note, however, that coordination at the national level would be needed in the case of research and development instrument acquisition requiring large items of scientific equipment (the individual value of which is more than approximately $100,000) or unique techniques (including, for example, material structure research). In addition to professional coordination, this coordination might create a common material base for those devices which are especially important for an entire scientific or economic branch. Unfortunately it is the practice today that equipment does not always go to where there is the best intellectual base for its operation in the service of national tasks. Because of the few material assets, we should create research-service centers. But only for large items of equipment. And the sphere of these changes with time. An instrument which was counted as a "large instrument" a few years ago is today an indispensable tool in every chemistry laboratory (for example, a gas chromatograph). A supply of medium and small instruments, the "basic supply" for research, must be ensured in every research site!

When setting up the centers, we certainly must take into consideration what research results have been achieved by those competing for the large items of equipment. Valuable equipment should be received only by a research site where they have already proved, with results at the international level, that the instrument will be in good hands. At the same time, it would be the task of these centers to satisfy the needs of the academy, or even national needs, too. Naturally, the cooperating research site providing the service must be made materially interested in carrying out this task, for operating and maintaining a large instrument is an expensive task. In my judgment, there were a number of uncoordinated acquisitions in earlier years; the large instruments did not always go to the proper place. Many times personal-institutional rivalry played a role in this, too.

The operation of the Instrument Affairs Service in its present form is contrary to the interests of academy basic research. The enterprises are using the foreign exchange equipment in order to save foreign exchange. There is relatively little equipment which the institutes of the academy hire out (paying a very stiff fee). The question arises: Would it not be better, in this extraordinarily difficult investment situation, for the MTA to give up its national tasks in instrument leasing? This should not be an academy task today, when the institutes lack basic instruments. Because of specialization, it is less and less possible or worth while to create general purpose instrument banks today. It would be much better if, when an item of equipment is needed for a given task for a given time, the researcher involved were to go

to the institute which has the item and do the measurements there. The institute operating the instrument would get a certain "service, cooperation" refund for this--from central funds. This latter proposal is being realized already in certain areas. A good example of this is that we have done single-crystal diffraction and ESR spectroscopic research at the KKKI for research sites under the supervision of the Ministry of Culture, and the ministry supports this cooperation materially also.

Cooperation with the universities is of special significance, because, instrument supply for higher education is extraordinarily weak in places.

Zoltan Szatmary: There is little money, especially capitalist exchange, which can be turned to investment; this is well known and the reasons for it and the possibilities are known also. But one cannot understand, if this is so, why the regulation of the spending of the money is so complicated (and increasingly more complicated). In my opinion, just the opposite would be justified: The less money there is available the simpler (cheaper and more efficient) should be the administration and the decision possibilities. The only way I see to use the small amount of money properly is if, after a swift central distribution of the allocations going to the institutes (if possible a distribution applying to several years), the directors should get a free hand and should be able to take care of acquisition directly and quickly. In the present practice, it is not rare that years pass in the course of an acquisition which has been selected and repeatedly subjected to competition, judged, submitted, rejected, etc., and in the meantime new models have appeared, the theme has been abandoned, etc., but even a small detail cannot be modified, because then the entire procedure would have to be started over again. Not even to speak of the fact that with such a tempo of administration either there is an attempt to acquire only very general-purpose equipment (this is why computers are so popular) or the themes are never completed, because by the time the equipment arrives something else must frequently be done for professional reasons.

Karoly Szego: It would be good to know what the expression "present economic circumstances" means. If it means that we must continue to spend money in an unplanned way, then I would do the same thing the MTA and most of the leaders have been doing. If the question means how I would try to manage with about this amount of money, then the conditions still must be made more precise. Because if the possibility of buying books and journals is too limited, if there is not enough money to maintain international contacts and if the infrastructure representing the background for research is not satisfactory, then I would shift the money to these things. (Is it possible that the present allocations are not enough even for these things?) When distributing the remainder one might weigh three main groups: How much should we spend on general-purpose computer technology, how much on large equipment (by this I do not mean the customary value limits, but rather things with which more than about 30 researchers can work), and finally how much remains to provide instruments for individual themes. I would not recommend setting up new large items of equipment today. (Cf.: "Do you want milk or honey?" asked Bunny. "Both!" said Teddy Bear. And added, lest he appear greedy: "But I don't want any bread.")

I would give priority to computer technology, because this can be used by, in addition to theoretical researchers, the experimental researchers who go abroad to make their measurements. There is no doubt, however, that a reconstruction of the instrument park has been justified for 10 years. It is difficult to find good principles in the absence of figures. But if we could look ahead a bit further we might ensure the tranquil development of at least some successful research.

Tibor Vamos: Even amidst the restrictions oppressing the other areas of the country, the academy has had an especially bad time. For this reason the leadership of the country must be constantly warned about the long-range effects of letting the most important scientific base be ruined. Even in the period of the recent foreign exchange crisis every chief authority of an administrative character (for example, the Ministry of Financial Affairs, the Plan Office, etc.) got systems or expansions involving considerable capitalist imports.

The developmental plan outlined in connection with the preceding question must be worked out and government support for it must be ensured. Such a system is of great significance not only for research but also for other domestic and export users.

We must eliminate the bureaucratic obstacles which add to the objective obstacles. It must be possible to use without delay, through swift and direct channels, the foreign exchange once it is granted and distributed, without additional authorization procedures or the postponing administration of academy and other foreign trade organizations, with precise and immediate feedback concerning difficulties. The researchers of the academy placing the orders should be sure, without having to make inquiries, that they will get the tools needed for their work, without having to run about any more and in the shortest time which can be imagined for Hungary. Hungarian researchers must compete on the world market (the market of scientific and technical development) with people who get their tools by placing a telephone order.

Response By Deputy First Secretary Istvan Lang

The natural science research of the academy got into a difficult situation in recent years. Very serious currency difficulties were produced in the Sixth 5-Year Plan, and this had an effect on scientific research, too. The government put a reduction in foreign exchange allocations into effect in the interest of maintaining the external economic balance and preserving solvency. These measures affected our research sites in a large area--in the acquisition of instruments, machines, parts and material, in the purchase of books and journals, and in the sums which could be turned to the cultivation of international scientific contacts. The reductions applied primarily to acquisition or expenditures in nonruble accounting.

Even in this period the operational costs of our research institutes were basically ensured, although the increase in the budget at current prices did not follow the increase in the prices of materials and services in full measure. Our institutes made great efforts in the interest of more thrifty

management; they mobilized external economic resources (for example, income from contract research), and in this way they essentially ensured maintaining the conditions for annual operation.

But the problems of instrument acquisition, and of material and parts supply, affected the majority of the research institutes seriously. These cares and problems are reflected in the answers of the directors which they gave to the questions of the editors of MAGYAR TUDOMANY. An anxious responsibility for the future can be felt in these answers, but the pale light of optimism shines also, for it appears that we are already beyond the most difficult. At the same time, a realistic evaluation of the situation projects the possibility that we have fallen back irrecoverably in the scientific competition and have lost for a long time that position which ensured for Hungarian scientific research a relatively favorable and equitable place among the countries of Europe of similar size.

The data collected pertaining to the supply of instruments (which thus pertain to all the research institutes of the academy) are distressing. To a large extent, the inventory of machines and instruments has become obsolete, theoretically and physically, as a result of the several years reduction in investment expenditures. This is indicated well by the fact that while in 1977 the ratio of the net-gross value of the machines and instruments was 55 percent, this ratio had deteriorated to 44.8 percent by 1983. Unfortunately the magnitude of the decrease is greatest in those institutes where the use of large instruments is most justified (for example, in the KFKI and the SZTAKI [Computer Technology and Automation Institute of the MTI]). Less than one-third of the value of the supply of machines and instruments of the institutes (1.3 billion forints) is less than 10 years old. The average age of these is 5 years.

It is not enough simply to describe, report on and evaluate the present situation and at the end say only that this cannot go on. One must also weigh realistically "how far it can go on," that is how long before a state will probably exist where such basic damage is done to academy research that every change of "European competitiveness" will be ruled out for another 10 or 15 years. We recently made such a study in cooperation with the leaders of the research institutes. The general picture is that with a high degree of discipline, with economical research and by rational reductions in some programs we can produce conditions which can be tolerated for 1 or 2 years yet. But within 2 or 3 years there absolutely must be a noticeable improvement in acquisition possibilities. If this does not happen, then the backwardness cannot be avoided and irreversible processes will be produced in the areas of physics, chemistry, biology and computer technology. The "tolerability" is somewhat greater (3-5 years) in the areas of geo sciences, agricultural research and astronomy.

Our institutes are managing their existing resources very carefully in the difficult situation and they are also looking for other bridging solutions. A few thoughts should be expressed about these as well.

Cooperation among institutes and offering friendly aid are of increased significance in optimal use of instruments and equipment and in obtaining materials and parts. There are still internal reserves here. Swift and effective management of existing foreign exchange allocations also helps to overcome some of the difficulties. The directors justly complain that they have been unable to use a considerable part of the allocations released because of various restrictions and the complexity of the acquisition procedure.

Mobilizing external, foreign resources is one of the long-range tasks of a domestic research organization. Exploiting such possibilities will be timely even after an easing of our economic difficulties. One form--perhaps the simplest form--of this is the one recommended by the director of the SZBK: We should make it possible to use the saved income of our researchers working abroad to purchase chemicals and smaller items of equipment, selling them here at home for forints under legal conditions in a way fair to everyone.

External resources might also be used within the framework of cooperation agreements signed with foreign research sites. Undertaking foreign work, individual invitations for study tours and contract research work signed for with foreign institutions should be put into the service of the above goal to an ever-increasing degree.

But what is most important is to make the political and state leadership aware of this situation analysis and of the problems threatening the future of research.

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HUNGARIAN BIOLOGIST REPORTS ON PUSHCHINO RESEARCH CENTER

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[Article by Peter Zavodszky, Institute of Enzymology of the Szeged Biological Center: "The Great Research Centers of the World: The Pushchino Biological Research Center"]

[Text] The Pushchino biological research center was actually created out of nothing, at least in regard to the city and the buildings. At the beginning of the 1960's only a few little wooden houses hid beneath the birch trees in the parklike area on the banks of the Oka, recalling the mood of the old Russian region. Outside of the inhabitants of the environs, not many knew the name Pushchino, and if strangers came there they were seeking only the pleasant sandy riverbank. As for the intellectual part of the research center, it certainly is not true that it was born from nothing. The Pushchino of today has its roots in the best schools of Moscow, Leningrad, Tbilis, Kiev and other intellectual centers.

Construction began in 1961 with the laying of the cornerstone of the Biophysics Institute, and in a few years the idea of a complete biological research center had been developed. Academician Gleb Mihailovich Frank, then director of the Biophysics Institute, took upon himself a large part of the great work of organizing it and getting it started. Two former presidents of the Soviet Academy of Sciences, Nyesmeyanov and Keldis, gave the matter special attention. It is thanks to this that a large-scale, real scientific center, developed with great attention to every detail, came into being in a relatively short time in the place of the old little village about 90 km south of Moscow.

The several institutes were formed one after another and moved to Pushchino. The first was the Biophysics Institute, built in several stages between 1961 and 1966. The Microbiology Institute (Institute for the Biochemistry and Biology of Microorganisms) was formed in 1965. The Protein Research Institute was created in 1967, followed by the Agrochemistry and Soil Sciences Institute and the Photosynthesis Research Institute. The computer center was formed in 1972. From the beginning the building of custom-made and series instruments was aided by the Special Biological Instrument Building and Design Office, which was formed in 1963 within the bosom of the Biophysics Institute and which has been operating as an independent organization since 1965.

The growth continues even today, if at a slower tempo than in the heroic age. The Immunological Division of the Bio-organic Chemistry Institute, named for Shemyakin, was formed recently in Pushchino. The cornerstone for a new laboratory block was laid in November 1982.

It may appear that a few important scientific areas, such as, for example, genetics, cytology, botany, hydrobiology, etc., are not represented in the list of institutions of the Pushchino Biological Center. The reason for this is that institutes specialized for these areas, having great traditions, operate in other cities within the framework of the Soviet Academy of Sciences and the agrarian sciences and medical sciences academies. Naturally this does not mean that these branches of science are forced into the background in the work of the Biological Center. When necessary there is close cooperation there, primarily with the Moscow institutes; in other cases, such research is integrated into the structure of the Pushchino institutes. As examples I might refer to the genetics work being done in the Microbiology Institute or the cytological work being done in the Biophysics Institute. This work is an important part of the activity of the institutes in regard to both its magnitude and its level.

When listing the scientific establishments at Pushchino we should not forget about the Radio Astronomy Station of the Physics Institute named for Lebedyev. Actually this was the first scientific institution in this quiet region. Construction of the powerful 1 x 1 km, cross-shaped radiotelescope began in 1956 in the heights along the Oka.

It appears even from this brief listing that it is not an easy task to write a comprehensive report about Pushchino. Simply listing the themes being cultivated in the several institutes and outlining every aspect of the scientific life there would in itself make a thick volume. On several occasions it has been possible for me to spend longer or briefer periods in this exciting place, and professional and friendly threads bind me to a number of researchers there, but even I dare not attempt to give a complete picture of the activity of this research center.

The Role of the Leaders

When describing the several institutes, I will try, using data, to give a general description at a similar depth on the basis of identical points of view. I would like to emphasize that I have more basic personal experience only in connection with the work and lives of several research groups at the Protein Research Institute and the Biophysics Institute, so the emphasis and connections are formed willy-nilly by the effect of these impressions.

It is also difficult to outline a general picture because it has very many colors and shadings. I do not know to what extent it reflects the original "center" conception but I have found that the personality and area of interest of the almost omnipotent leader determines almost exclusively the scientific profile, style of work and level of the several institutes and even laboratories. Respected, internationally recognized personalities who had already formed schools were named as directors of the institutes and leaders of the

more important laboratories. After that, these leaders enjoyed almost complete freedom in developing the themes and the organizational forms. An interesting example of this is a comparison of the Biophysics Institute and the Protein Research Institute. About one-third of the 1,150 employees of the former institute are scientific workers. The institute is large and extraordinarily heterogeneous in its work. Everyone does what he likes in the spirit of the "Frank" idea; something truly good and interesting always comes from many things, especially if we are talking about large numbers, as in this case. What has been done thus far seems to justify this principle. This conception does not nip anything in the bud because one cannot know in advance what will come from what, and especially from whom. The entire organization of the Protein Reserach Institute reflects precisely the opposite idea. The formula is: Select a few interesting areas and themes on the basis of the collective wisdom of a certain narrow circle--the top leaders--and concentrate all resources on their methodical cultivation. The structure of the institute reflects this, too; only 15 percent of the 400 people are researchers, the rest are technicians or other service personnel. Many sites, good equipment, a good internal "infrastructure." Democracy in the scientific debates and among the leaders in selecting a theme, but strict dictatorship in execution and in distributing the tasks. This conception, differing radically from that of the Biophysics Institute, has also proved successful, as is shown in the imposing publications list and good international reputation of the Protein Research Institute. I give these two examples only as an illustration of the fact that it is possible to organize a successful intellectual center on the basis of radically different viewpoints and conceptions.

The unity of the Pushchino center is due primarily to the good objective conditions for cooperation, the openness in this sense of the institutes and people, the many common professional and public life forums and the geographical proximity. This openness is realized not only within the little town but on a national and international scale as well. Appropriate selection of the institute and laboratory leaders is one of the important sources of the intensive and successful contacts within the country; almost all of them have some sort of position in other institutes as well. Many teach at the Moscow universities or head laboratories in significant Moscow or Leningrad research institutes with great pasts. Some have two residences, with houses, jobs and, naturally, contacts in both Moscow and Pushchino. I see this dual residency more as an advantage than as a disadvantage because it accelerates the institutional exchange of information, which is otherwise clumsy, turns it into personal channels, makes valuable equipment mutually accessible and ensures the movement of young people between various research sites. There is a great need for such mobility because it is difficult to change jobs in the Soviet scientific sphere, and many retire from the same place where they began their activity.

The permanency of the personnel is also a characteristic element of the Pushchino center, with all its advantages and disadvantages. It is an important advantage that one does not have to prove oneself everyday, which makes possible the cultivation of longer range themes requiring greater depth and permits the solution of less spectacular tasks, and this is an undisputed advantage for universal science. It is a disadvantage that the weeding out of

less talented and less successful researchers is slow; the stability makes things comfortable. These colors appear clearly on the palette of the institution. It is striking what a large ratio in the activity is represented by minute, complicated physical measurements and tedious themes requiring the construction of custom-made instruments, in contrast to the American or Western European research based on short- and medium-range competitions. Following the "fashionable trends" is also slower, but in contrast to this the themes are worked on in basic detail and there is long-range continual cultivation of them.

The Biological Research Center has an important role in the system of Soviet scientific training and further training, and this role guarantees a certain personal mobility and the possibility of a selective choosing of replacements. There is a constant flow of graduate students and scholarship students from other cities, republics and foreign countries. The scholarships of 1 to 4 years provide an enthusiastic and diligent work force for the solution of specific tasks. In general the best of them succeed in getting permanent positions in Pushchino, most go to provincial universities, research institutes or industrial installations, but thanks to the personal contacts they continue to get professional aid and guidance. Very many of them return for visits even after the passage of one or two decades.

Institutionalized cooperation and occasional travel and reception of guests play an important role in the international contacts. It is perhaps here that the aspiration for integration into international scientific life is strongest. The city's own hotel, the dining halls and the many seminar and lecture halls provide a good background for the organization of national and international conferences and working meetings. The smaller special working meetings are especially frequent, and seminars are held every day by prominent domestic and foreign guests. The ratio of articles published in the English language in international journals is very high.

I believe it would be best to give a brief summary by institution to describe the thematic and methodological repertoire.

The Biophysics Institute

The Biophysics Institute should be first by virtue of age and size. The institute was organized in Moscow in 1952 by uniting three laboratories working in biophysics; these were the Medical Biophysics Institute founded in 1919, the Radiobiological Laboratory of the Biochemistry Institute of the Academy of Sciences of the Soviet Union which has been in operation since 1921 (in Moscow) and the Biophysics Division of the Physicotechnic Institute founded in Leningrad in 1920. The institute gradually moved to Pushchino between 1961 and 1966. Very many more or less independent areas are represented in its activity--as I have already mentioned. Formally it is divided into 7 departments and 40 laboratories within these, but the number of themes cultivated is greater than this. It may be worth mentioning the names of the departments and their leaders in order to get oriented among the themes cultivated by the institute. The "Physics of Biomolecular Structures" department is led by Mikhail Vladimirovich Volkenstein, who left a well-established, famous

laboratory in Leningrad in the Institute of Macromolecular Compounds in order to organize this laboratory in Pushchino. At the same time, he was also entrusted with leadership of a laboratory of the Molecular Biology Institute in Moscow. His department deals primarily with the spatial structure of proteins, conformation statistics, theoretical and technical development of magnetic circular dichroism and optical rotation dispersion methods and with application of the methods in the area of the structural investigation of proteins. Their activity is of a pioneering nature in this area and the instruments made by them are the most sensitive of their type in the world.

The "Biochemical Regulation" department is led by Mario Nikolayevna Kondrashova and the "Biological Mobility" department is led by Vasilyevich Lednyev. The activity of the latter department is quite varied and deals with everything from molecular dynamics through oscillating systems to biological questions. Their research pertaining to oscillating systems and mechanical vibrations at the molecular level is especially worthy of note and is internationally recognized. The chief of the membrane biophysics department is Valentin Izraelvich Krinskiy, that of the cell biophysics department is Arkadyi Yustianovich Budantsev, that of the radiobiology department is Aleksandr Mikhailovich Juzin and that of the memory research department is Elena Anatolyevna Gromova. This list alone shows that the institute covers a very broad area of biophysics.

The development of new measurement procedures and instruments has a very important place in the activity of the institute. Worthy of mention, for example, is an automatic scanning system prepared for optical microscopes which works on a new principle. An entire family of instruments on the basis of this principle, bearing the name "Morfokvant," has been developed jointly with the Carl Zeiss factory in Jena. This unique instrument is used widely in scientific and industrial areas alike for the study of microsopic objects. Boris Nikolayevich Veprintsev and his research group were awarded the State Prize in 1982 for development of a microsurgery instrument ensemble suitable for, among other things, measuring the electric characteristics of living cells. More than 50 new instruments and measurement procedures have been developed in the Biophysics Institute in the past 7 years, and all of them are being manufactured and used. These include, for example, complex, controllable equipment for the cultivation of animal cells and a precision ultrasonic density meter.

But the basic task of the institute is basic research, and several significant theoretical and experimental achievements have come from here which have won worthy recognition around the world. These important discoveries include a description of a new class of self-maintaining waves which has contributed greatly to the understanding of the principle of self-organization of biological systems. Henrik Romanovich Ivanitskiy, the present director of the institute, Anatoliy Markovich Zhabotinskiy and their colleagues were awarded the Lenin Prize in 1980 for this work.

The institute has very good international contacts and Hungarian biophysicists are working within its walls almost all the time, too.

Microbiology Institute

The Microbiology Institute was formed in 1967 as a result of the organizing work of Nikolai Dimitrievich Yerusalimskiy, the director at the time, and Georgiy Konstantinovich Skryabin, the present director. Two hundred of the 700 personnel are researchers and more than half of these have scientific degrees. The institute deals with both theoretical and applied research and it is the center of Soviet gene surgery and molecular biology. The most important research themes are the following:

--molecular biology and molecular genetics of microorganisms;

--the scientific bases of protein synthesis by microbiological means and other areas of applied microbiology;

--metabolism of microorganisms and the control of metabolism;

--dynamic microbiology; and

--anatomy and biophysics of microbe cells.

At first one of the chief tasks of the institute was development of the theoretical foundations of microbiological protein synthesis from hydrocarbons. This theoretical work, of the character of basic research, later brought practical profit and the world's first factory producing vitamin-protein concentrate feed on the basis of petroleum was able to be built on the basis of principles worked out here. Yerusalimskiy and his colleagues were awarded the State Prize for this achievement. This program continues today in part with research aimed at production of protein suitable for nutritional purposes from methyl alcohol, ethyl alcohol and natural gas by microbial means and in part with development of the scientific foundations for production of proteins and engine fuel by microbiological means from renewable resources.

Another important trend is the study of microorganisms which are capable of the synthesis or transformation of effective biological materials which can be used in medical diagnostics. This work has already had some nice successes, such as the production of ribonuclease and cytochrome C preparations and developing a technology for the production of various antibiotics, alkaloids and steroids.

The molecular biology and molecular genetics department led by Aleksandr Aleksandrovich Bayev has been in operation since 1969; in addition to extensive basic research it has the task of solving practical problems, too. In the sphere of basic research they are studying the interdependence between the structure and function of nucleic acids, the molecular mechanism of genetic processes and questions of gene surgery. In addition they are working on creating strains of bacteria which are capable of increased production of proteins and enzymes which can be used for medical or industrial purposes. This group maintains good contacts with researchers of the Szeged Biological Center.

An important theme of the institute is research on the role of microorganisms in processes of nature. This includes the mechanism of the microbial decomposition of crop-protection materials, a study of the global bio-geochemical cycle of sulphur and research aimed at reducing the methane danger in mines. Well-qualified researchers dealing with basic research constitute the intellectual base of the institute and it is a good example of their activity that it is not difficult to find practical utilization of the basic research seeking for new things.

Protein Research Institute

The Protein Research Institute was organized in 1967 by Aleksandr Sergeyevich Spirin, in close cooperation with the later leaders of the laboratory. This institute has a uniform theme despite the fact that the researchers working together have quite varied backgrounds and spheres of interest. The central theme is the mechanism of the development of proteins. This problem can be broken down into two spheres of questions: a description of the biosynthesis of polypeptide chains and the self-organization of the spatial structure of the completed chains. The molecular mechanism of the functioning of the ribosomes stands in the center of the first sphere of questions, with special regard to the translocation mechanism, the structure of the ribosomes, the control of protein biosynthesis and the structure of biological role of the informosomes. In addition to understanding the principles and interdependencies, a large role is played in this area by detailed descriptive work, isolating the individual ribosome proteins and establishing their sequence and spatial structure. The disciplined and coordinated work, almost like a factory, produced a great quantity of material in a very short time and made the institute known as one of the first ribosome research institutions in the world. It is no accident that in 1969 the FEBS [Federation of European Biological Societies] awarded A. S. Spirin the Hans Krebs gold medal for his achievements in ribosome research.

The second sphere of questions--research on the spatial structure and self-organization of proteins--can also lay claim to nice achievements. The personalities defining this area are Oleg Borisovich Ptitsyn, who worked in Leningrad in the Institute for Macromolecular Compounds as a well-known polymer physicist, and Peter Leonyidovich Privalov, who won a name for himself in Tbilisi in the institute dealing with the physics of low temperatures with the development of the world's most sensitive (10^{-6} Watt) adiabatic registering microcalorimeter.

The uniform theme is cultivated in an organization broken down into nine laboratories and five research groups. I believe it would be worth listing these units according to theme: Aleksandr Sergeyevich Spirin is chief of "the mechanism of the biosynthesis of proteins"; Lev Pavolovich Ovchinyikov is leader of "the control of the biosynthesis of proteins"; Nikolay Ivanovich Matviyenko is chief of "molecular genetics"; Yuri Anatoliyevich Ovchinyikov is chief of the "chemistry of proteins" and director of the Shemyakin Institute in Moscow, and he devotes very great attention to actual guidance of this research group in addition to or despite his activity as a director and vice president of the Academy of Sciences of the Soviet Union;

Yuri Vasilyevich Mityin is chief of "chemistry of peptides"; Oleg Borisovich Ptitsyn is chief of "physics of proteins"; Peter Leonyidovich Privalov is chief of the "study of protein structure," was earlier an expert in spectroscopy who courageously set himself to organizing an independent, protein X-ray crystallographic laboratory and in addition to much promising work in progress has already succeeded in defining the spatial structure of gamma crystalline; the chief methodological profile of the laboratory dealing with "physics of nucleoproteides" is use of dispersion methods. They have built extremely well-automated equipment for measuring small-angle X-ray dispersion.

Five smaller research groups serve this work, partly with service activities and partly by joining in the processing of the themes with their own methodological tools. These are the "protein spectroscopy," the "electron microscope," the "stereochemistry," the "preparative biochemical" and "organic synthesis" groups. The spectroscopy group led by Sergei Yurievich Venyaminov has good equipment and does methodological development in addition to theoretical research. They work with automated and computerized instruments in the areas of infrared, ultraviolet, optical rotation dispersion and circular dichronism spectroscopy. An atlas of the spectral properties of all ribosome proteins is the work of this laboratory.

The organizational breakdown of the institute is based on the method of approach and the method of research. The number of researchers in the several laboratories or groups is not large, averaging three people. This breakdown reflects a great deal. It shows that there are many independent, well-trained researchers who are able to work according to their own ideas--and in general the institute makes this possible. It shows that research on the common theme is done from many sides, in regard to theory and method alike. And it shows that the research is focused by the common interest rather than by the organizational form. Ad hoc associations are formed for joint study of individual questions, there are many consultations and seminars, the activity of the other groups is drawn in by each good idea. As I have already mentioned, there are "obligatory" tasks of a service nature, but basically the cooperation is motivated by interest in the theme.

In addition to the ribosome research, a striking aspect of the activity of the institute is the theoretical activity dealing with the self-organization of the spatial structure of proteins, which is stamped by the name of O. B. Ptitsyn. His theoretical ideas aimed at an understanding of the mechanism of changes in spatial structure have stimulated experimental work in many other groups of the institute. In the laboratory of P. L. Privalov, a synthesis of theoretical, instrument-building and experimental activity has led to achievements which permit a coherent physical description of the spatial structure stability of proteins and which have won unanimous international recognition. The adiabatic registering microcalorimeter which is sought throughout the world and which is in series manufacture in the neighboring Biological Instrument Building and Drafting Office is, as it were, a byproduct of the activity of this latter laboratory. This instrument is suitable for precise measurement of the--very tiny--specific heat changes connected with the intramolecular restructuring of proteins.

The institute approaches questions connected with the spatial structure of proteins with the method of molecular dynamics and it had a pioneering role in the current spread of this approach. Among those dealing with protein research, the name of Pushchino means an institution which is known and recognized. Domestic recognition is not lacking; in 1976 the work group of A. S. Spirin was awarded the Lenin Prize for its achievements in the discovery and study of informosomes. In 1978, P. L. Privalov was awarded the State Prize for development of the highly sensitive microcalorimeter.

It is difficult to find an international symposium or working conference in the area of the research of the institute where we do not find the name Pushchino among the speakers invited. The institute is very productive and the overwhelming part of its publications appear in good international journals, in the English language. Representatives of the institute can be found in the editorial committees of these journals also. The good equipment, the stimulating intellectual atmosphere and the ample room are attractive to foreign guest researchers. A few people from America, West Europe and the socialist countries are nearly always working here together with guests from other republics and cities.

The Soil Science and Photosynthesis Institute

The Soil Science and Photosynthesis Institute was formed in 1982 with the combination of the Agrochemistry and Soil Science Institute and the Photosynthesis Institute. The great advantage of this combination is that now they can study in a complex manner the phenomena connected with the productivity of crop cultures, previously studied separately but interdependent with one another. The most important research task of the institute is research on the energy and mass regulation of the "soil-plant-atmosphere" system with the goal of showing the most effective way to increase crop production and the productivity of the soil. The economic profit to be expected from this research activity is extraordinarily great. The first task is to clarify the theoretical interdependencies. On this basis, the institute is working out melioration, species selection, artificial fertilizer and other recommendations for agriculture.

Of the 560 people working in the institute 200 are researchers, the rest are auxiliary personnel; it is divided organizationally into 16 laboratories, 2 sectors and 8 research groups. Several service sections are joined to this. Mikhail Sergeyevich Kuznyetsov became director of the reorganized institute. The most important research themes are the following:

--soil ecology;

--soil improvement;

--the soil as the subject of human economic activity;

--the lawful relationships of the bioproductivity of various regions;

--photosynthesis as a basic method for transforming and storing solar energy; and

--the biophysics, biochemistry and biology of photosynthesis; the photosynthetic basis of crop production.

Basic research and applied research are mixed in the activity of the institute. Its researchers have won a good international reputation in, among other things, research on the physical foundations of photosynthesis. These results can be attributed to the use of complex physical measurement techniques. Using equipment which they have built themselves they are measuring spin polarization at low temperatures, and using time-analysis spectroscopy they are studying the movement of charges in the reaction centers of photosynthesis on a scale of picoseconds.

With its recommendations, the institute regularly helps the activity of agricultural operations and undertakes a role in the solution of a number of practical tasks. This activity combines well with the high-quality theoretical biophysical and biochemical activity taking place within the walls of the building, activity which serves as a basis for the solution of concrete agricultural tasks on scientific foundations.

Newer Institutions

Despite the fact that the period of intensive development and spectacular new investments is over, Pushchino is reacting sensitively to every change in the currents of the biological sciences. It is thanks to this and to the continual attention of the Soviet Academy of Sciences that the city was enriched with a new institution in 1982. At the initiative of the director, Yuri Andreyevich Ovchinykov, the Moscow Bio-organic Chemical Institute named for Shemyakin established a new immunological section here. This institute is called on to produce an immunological background for the biotechnological industry, with a great expansion of the possibilities for basic molecular immunological research. Up to now, immunochemistry and molecular immunology have not been represented to a significant degree in the institutes of the Soviet Academy of Sciences; the development which is beginning now and gradually being realized will build primarily on young people and the laboratory buildings being built will be filled by them.

Research of a physical chemistry nature will take place in this section, on biological subjects. They will study the interdependence between the structure and function of the macromolecules participating in the immune response, the molecular mechanism of the immune response and immunogenetic themes. Another planned theme is development of controlled synthesis of various immune regulatory compounds. The young researchers who will in the future take over the institute being built here are already working in their designated themes in various cities of the Soviet Union. The buildings, the demanding and ample equipment, the energetic leadership and the young, ambitious research staff project a picture of a very significant molecular immunological center.

When listing the institutions at Pushchino we should not forget to mention the Special Biological Instrument Building and Design Office (SKB BP). The Presidium of the Soviet Academy of Sciences recognized that modern biological research can be done only with the aid of special, modern instruments. This is why, in the very beginning, they created this institution in the framework of the center.

The close connection between researchers and engineers, between science and industry, proved to be mutually advantageous. In a number of areas the SKB created the instrumental conditions for top-quality special basic research (for example, microcalorimetry) while on the other hand, they succeeded in transferring the most recent achievements of science directly and quickly into practice. The designing and manufacturing activity embraces quite varied areas. They make instruments here which are suitable for study of the properties of living cells; they make fermentors, calorimeters, optical and spectroscopic instruments and chromatographic equipment. Since these instruments are made in close cooperation with the research groups of the Pushchino institutes, the first users, they generally represent the most sensitive solutions corresponding to the age and regularly make possible research which is new in principle. The designs are outstanding and they are already manufacturing in series the precision devices for measuring the electric properties of living cells and the DASM-4 microcalorimeter, which were developed jointly with the Biophysics Institute and Protein Research Institute, respectively. In addition to precision instruments they also make reliable and modern auxiliary equipment (for example, sterilizers).

The director of the institution is Valeriy Arkadyievich Izotov; he coordinates the work of the SKB with the needs of the research institutes and with certain business viewpoints, for some of its products are exported, many of them to developed capitalist countries. The Council of the Biological Center approves the activity and plans of the SKB. According to plans extending to 1990 they will deal primarily with development of fermentors, cell-microsurgery devices, chromatographic and immunological methods, calorimeters and acoustic instruments.

The Biological Center has one other common scientific institution, the Computer Center. It was organized in 1972 with the task of providing the computer background needed for the scientific institutes and aiding the application of new mathematical methods in biological research. Its director is Albert Makaryevich Molchanov. The Computer Center conducts not only service activity but is a partner with equal rank in certain research areas. Such, for example, is the X-ray-crystallographic work of the Protein Research Institute; the mathematical modeling of complex biochemical reactions in the Biophysics Institute; model computations and approximations describing the molecular dynamics of polymers, also in the Protein Research Institute; probability modeling of short-term memory in the Biophysics Institute; and we could continue the list. It also does important developmental, organizational and coordinating activity in the area of automating scientific research work. An important task in progress is building up a common computer system covering the entire Biological Center. Installation of the terminals began in 1982.

A Sparkling Intellectual Life

Twenty-five years have slowly passed since the founding of the Pushchino Biological Center. It is now possible to measure the results and reassure the doubters. Soviet and universal science have been enriched with things of great value and the capital invested in Pushchino is paying off nicely.

I described the institutes of the Biological Center one at a time, but in conclusion I would like to emphasize that unity and a uniting of forces dominate in the entire city. I believe that, in addition to the good objective conditions, two things make Pushchino into a creative intellectual center and raise it to the ranks of the recognized world research centers--a greater than critical mass of educated experts and the good conditions for intensive interdisciplinary communication. In the course of my visits, I always felt that something was constantly happening here, that here one could consult with someone about any scientific question, that any well-thought-out experiment could be carried out. It is also important that the intellectual spirit is not limited to natural science research; everyone is interested in something else too. Some write essays, others paint, others carve wooden statues or play music in friendly groups in the evenings. The optimal size and relative quiet of the city are important factors. Here the cultivation of science becomes a way of life for families; the days are filled with work done because it is interesting, always exciting but rarely under pressure, interspersed with other activities. Late in the evenings one can always find in the institutes partners suitable for conversation or debate, the library is open, the instruments are working, one can ask for a loan of chemicals at 2 o'clock in the morning.

Many visitors come to Pushchino from Moscow, from elsewhere, from abroad. Prominent politicians, artists and social scientists hold lectures. The relative proximity of the capital dissolves the feeling of isolation. Direct buses go to Moscow practically every hour, linking the center to the academic institutes there and to the MGU [State University of Moscow], where many give university lectures.

The words of its present director, Henrik Romanovich Ivanitskiy, give the best feeling for what has been undertaken and what is being realized anew every day at the Biological Center: "We see the obligatory and inseparable task of our scientific center and of the young city identified with it not only in working out practical guides for the economy but also in the aspiration that... we should create a modern scientific worldview, the essence of which is the harmony of people with one another and with nature. The successful solution of this task should have a social effect, not only for our state but for all mankind."

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BRIEFS

COMPUTER EQUIPMENT READILY AVAILABLE--At our specialty shop for organization technology devices and paraphernalia at No 2 Nepkoztarsasag Ut, Budapest VI (telephone 531-231) one can purchase immediately or within a short time the Ascota 170 control equipment for accounting machines, domestically manufactured program cassettes and socialist import 1702 IC PROM's for Robotron 1711 and 1720 machines, program drums and program tapes for the R 1355 small accounting machine and ink ribbon cassettes, daisy wheels and write cylinders for the R 5100 small office computers. One can get magnetic strip cards of various sizes, magnetic strip cards for the R1370 data recorder, 5 and 8 channel punch tape, roll paper, ink cloths and ink ribbons. We get magnetic data carriers from capitalist import and sell them through a consignment warehouse. We accept advance orders for various magnetic disks, floppy disks, magnetic tapes and cassettes, and we inform our customers after the arrival of the goods. The address-writing machines and tapes, card storage boxes, organizing carts, fan paper and floppy disk storage folios, A/3 and A/4 size zip fastener folios, punch tape storage boxes, radiation proof magnetic data carrier shipping cases, cassette storage holders and magnetic display boards sold in the specialty shops significantly facilitate the arrangement, recording, shipment and storage of the documentation piling up in computer technology and office work sites. [Excerpt] [Budapest SZAMITASTECHNIKA in Hungarian No 7, Jul 84 p 4] 8984

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ACHIEVEMENTS IN MICROELECTRONICS, COMPUTER TECHNOLOGY

Bucharest REVISTA ECONOMICA in Romanian No 41, 12 Oct 84 pp 14-15

[Article by Ioan Georgescu]

[Text] According to specialists, one of the leading fields in tomorrow's economy, the pivot of the new industrial revolution, is microelectronics and computer technology. Microprocessors and software are the "heavy industry" of the current stage of economic development. Our country's full involvement in the fulfillment of the new industrial revolution, at the request of the secretary general of the party, Nicolae Ceausescu, has led to the production of the first automated systems based on microprocessors, and to expanded applications of computers in the most varied fields of the economy based on Romanian computer technology.

Stage I (1983-1985) in the formation of the Unirea national computer network is in full progress, with completion of Stage II being planned for the next 5-year plan so as to configure the infrastructure of the national computer network. Cooperating in this vast project, under the leadership of the national Council for Science and Technology (CNST), are the Central Institute for Management and Information Processing (ICCI), the Research and Design Institute for Transportation and Telecommunications (ICPTT), the Institute for Automation Design (IPA), the Computer Enterprise (ICE), and other economic units; this system aims to connect information processing centers equipped with Felix computers of various configurations distributed throughout the country, by means of high speed internodal lines operating at 48,000 bits/second, as a network of terminals connected to low speed lines. The experience gained in the construction of information systems of such magnitude is sure to recommend Romania's computer technology as a commercial partner of high standing on the international market. It is also why we have begun a description of Romania's exportation offerings at TIB (Bucharest International Fair) with this sector, in which it is increasingly difficult to distinguish between the work of research, production, and engineering services.

The computer revolution in the Romanian economy is extensively presented at the current anniversary edition of TIB, at the stands of the Ministry of the Machine-Tool, Electrical, and Electronic Industry. Following an almost

16-fold increase in the fixed assets of this branch, and the extraordinary growth in scientific research, the exportation effort of this branch has increased 35-fold in the past two decades.

The production of means of automation--which today is 10 times higher than in 1965--contributes to a 12.2 percent automation of production in the machine building industry, 9.7 percent in power generation, 8.5 percent in chemistry, 7.5 percent in the construction materials industry, and 5.1 percent in the metallurgical industry.

The configurations of the Felix, Coral, and Independent computers, together with terminals and data transmission equipment, assures a large number of applications in the management of the economy today. The present structure of computer technology utilization is: 40 percent in production management, 20 percent in management, 12 percent in research and design, and 28 percent in other types of applications. These figures reflect the priority assigned to information processing systems in production management, which along with meeting the needs of domestic users, are now exported to many countries as part of comprehensive units. Whereas in 1971 about 80 percent of the total export of means of automation, computer technology, and telecommunications was represented by means of automation, with the remaining 20 percent consisting of telecommunication equipment, today, computer technology represents nearly 25 percent. These changes are eloquent illustrations of the contribution made by Romanian computer technology not only to the modernization of Romania's economy, but also to the greater competitiveness of Romania's exportations of machines and tooling as a whole.

Extremely significant to the orientation of the present development in Romanian computer technology, is the TIB presentation of high performance computer systems which demonstrate, together with the quality of the hardware, the operation of the software systems formulated by Romanian programmers, as exportation items that are in increasing demand at the present time. The contribution of Romania's domestic research in computer technology production, including software, has increased spectacularly during the past two decades, from 19 percent in 1965, to 60 percent in 1975, and to the point where it now meets all the demand for new products and services in the branch.

Following are some of the production management computer systems shown at TIB:

System for initiating and monitoring production, formulated by the Central Computer Institute (ICI) and used at the Pitesti Automobile Plant and at the Bucharest Enterprise for Precision Mechanics. It provides operative programming of production lines by operations, production initiation (by products, consumption, materials, tools, devices, and controls), operative control of work in progress, and final control of production stations. Its application has led to significant increases in labor productivity, optimum loading of production facilities, and shorter manufacturing cycles in the units in question.

Specific information processing systems for managing continuous or semi-continuous production (chemical, cement), or discrete production (machine construction, metallurgy)--in which production is programmed by order lots--are already implemented at the Midia-Navodari Petrochemical Combine, the Metalotehnica enterprise in Tg-Mures, and other economic units in the country. They reduce material and energy consumption, increase physical production, provide optimum loading for facilities, and maintain stock at optimum levels.

Process control systems and automatic control computer equipment, such as the SELROM system for aluminum electrolysis, were developed for the specific needs of such sub-branches as the aluminum and non-ferrous metals industries; other systems were created for automatic railway car sorting, for remote control and monitoring of oil wells, for power distribution, for automatic sorting of patterns in the garment, leather, and metal cutting industries, and so on. To illustrate the economic efficiency of these production management systems, we will use as an example the one introduced at the Mirsa Mechanical Enterprise and at the Emailul Rosu enterprise in Medias, to program fabrication and control processes for sheet metal parts, thus reducing fabrication preparation from four hours to three minutes, along with significant savings of metal.

Major economic effects are also achieved through automatic management of material stores (with this application, the Buzau Switch enterprise for instance, saves more than 2 million lei per year in materials storage and handling), of information processing systems for stock supply, distribution, and management, and of data base management systems.

While system analysis and software play the major role in solving the complex problems of modern production and management with the computer systems mentioned above, there are areas in which the actual technical configuration of the equipment had to be adapted to the specific needs of the situation.

In this respect, new items at the present TIB are: DIAGRAM 2030, a system used for computer aided design; MULTIPROM, a system of digital electronic modules and subassemblies for industrial automations (to equip machine-tools and industrial robots operating with microprocessors); a management system for the maritime fleet; an automatic system for power distribution; a system for agricultural dispatching (pumping equipment, for instance) with remote data transmission; a system for machine construction design (which reduces drafting time by 50 percent); monitoring and regulation systems for the chemical and power industries (SCA, SRA); a system for automatic electric power management; a system for diagnosing cerebral vascular problems (BRAIN); a system for data collection and processing (in materials management) with 32 terminals (SCUP); individual professional computers for technical, scientific, and statistical calculations; AMIC and PRAE small systems with TV screen displays and tape cartridge memory; and an electronic identification control system, SECOL 80.

The majority of these complex products are the result of a close collaboration among research collectives of industrial units: the Bucharest Computer enterprise, the Bucharest Enterprise for Peripheral Equipment, the Cluj-Napoca Industrial Electronics Enterprise, and so on, as well as with microproduction departments of research units: ITC (Institute for Computer Technology), ICI, IPA, and so on, in higher education.

The prospects opened by the draft of the Directives of the 13th Congress of the RCP, for the continued development of microelectronics and computer technology, will assure an increasing penetration of the products of Romanian creativity on the world market.

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